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General Article

NEMBUTAL ANÆSTHESIA IN THE DOG

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The use of the derivatives of barbituric acid as anæsthetics and narcotics in animals has received considerable attention during the past few years, and reports regarding their use have appeared from time to time in veterinary literature. The two outstanding members of the group would appear to be nembutal and sodium evipan. A report on the use of the latter has recently been published by Auchterlonie,[1] but it is with the former that this report is concerned, as it is considered that nembutal is the more useful of the two agents.

Nembutal (sodium ethyl-methyl-butyl barbiturate) was first introduced into veterinary surgery by Kreutzer[2] in the United States. He administered the drug by intraperitoneal injection, and recommended a dosage of one-fifth of a grain per lb. body-weight. The first published report of its extensive use in animals in this country was by Wright,[3] who recorded his experience in a series of over 100 cases in the dog and cat, both the oral and intraperitoneal methods of administration being employed. It was found that results were by no means as constant as Kreutzer claimed, and that the unit dose varied according to the size of the animal, small animals requiring proportionately more than large ones. At a demonstration of the intraperitoneal method at Newcastle[4] by one of the authors (J. G. W.) the following dosage was recommended:—

lbs.	grains.
10	2·5
15	3·5
20	4·5
25	5·25
30	6·0
35	6·5
40	7·0
50	8·25
60	9·0

It has been found after considerable experience of this method (over 300 cases), that whilst this dosage gives results as consistent as is possible with such a method of estimation, considerable variation occurred. In some cases a noisy narcosis only was attained, whilst in others anæsthesia became alarmingly deep. (In an occasional subject there was no result at all.) This was only to be expected, for differences in individual susceptibility, the presence of diseased conditions, etc., which it was impossible accurately to assess when computing the dose, were bound to be encountered and so cause variations in response.

Two cases were met in healthy dogs in which a dose which was considered to be a safe one, proved fatal. Details of these are as follows:—

1. *Subject.*—12-months Pekingese, male. Weight 10½ lbs. Hydrophthalmos right eye. Operation—removal of eyeball. *Dose.*—2½ grains by i/p. injection. 5 *minutes after injection.*—Anæsthesia, induction perfectly quiet, reflexes brisk. 12 *minutes.*—Operation commenced. Animal lying on breast, an assistant's hands supporting the head under chin and over occiput. 18 *minutes.*—Operation completed. Respirations slow and regular. No alarm was felt. 20 *minutes.*—It was seen that respirations had ceased. Artificial respiration applied, and CO_2 administered by inhalation. This provoked no response. 22 *minutes.*—The heart beat could not be detected through the stethoscope. 0·5 c.c. liq. adrenalin. hydrochlor. administered by hypodermic injection into the myocardium of the left ventricle, and artificial respiration and cardiac massage through the chest wall carried out. In 10 seconds the heart recommenced to beat quickly and forcibly. Gasping respirations soon commenced and continued for a few minutes, when the heart again stopped Further attempts at resuscitation were unavailing.

2. *Subject.*—8-months Bulldog, male. Weight 47 lbs. Animal a bilateral cryptorchid, otherwise in perfect health. *Dose.*—9 grains by i/p. injection. 5 *minutes.*—Anæsthesia. Preparation of site for operation commenced. 15 *minutes.*—Cyanosis, respirations slow and shallow. Tongue drawn out of mouth and periodic artificial respiration commenced. 18 *minutes.*—Respirations ceased. Continuous artificial respiration applied, with CO_2 by inhalation. Intra-cardiac injections of adrenalin. No response.

Post-mortem examination failed to reveal any abnormality to account for the increased susceptibility.

These two cases serve to illustrate the toxicity of the agent. They represent, however, less than 1 per cent. of the cases in which the drug was administered by the intraperitoneal route, and despite them, it is considered that, from the point of view of toxicity, the drug compares very favourably with the accepted inhalation anæsthetics.

It was at this point decided to adopt the intravenous route of administration. This method has been carried out in man for some time,[5] but basal narcosis only, and not full anæsthesia, is induced.

In a series of 132 cases in the dog the method

has proved, in our hands, strikingly consistent and successful. In two the agent has proved fatal. One of these was an exceptional case, which might, with fairness, be dismissed. Details are as follows:—

1. *Subject.*—6-year-old Pomeranian, male. Weight 8¼ lbs. *Condition.*—Very weak. *History.*—Case sent to us by a veterinary surgeon, with a diagnosis of intra-thoracic obstruction of the œsophagus, of 4 days' duration.

Anæsthesia was present after the injection of 2 grains. One minute later respirations ceased, and cardiac failure almost immediately followed. The heart was re-started by the injection of adrenalin into the left ventricle, but there was no respiratory response.

Post-mortem examination revealed perforation of the thoracic œsophagus by a piece of bone, and a local mediastinitis. In addition there were several ruptures of the capsule of the liver with intra-abdominal hæmorrhage.

2. *Subject.*—6-year-old Pekingese, female. Fat. Estimated weight 14 lbs. Toxic. Suppurative panophthalmitis left eyeball, 8 days' duration.

Anæsthesia induced by 3·25 grains intravenously. 4 minutes later respirations ceased. Immediate auscultation revealed the heart to have ceased also. All attempts at resuscitation were unavailing.

On *post-mortem* examination the myocardium was found to be pale and flaccid. The endocardium lining the mitral and tricuspid valves was actively congested.

It is considered that the toxæmic condition of the myocardium predisposed to syncope in this case.

The dogs in which intravenous nembutal anæsthesia has been induced, have varied in age from twelve weeks to 15 years, and in weight from 7 lb. to over 100 lb. All types of case are included, and whilst some of the animals were healthy, the majority were diseased. In many there was marked disease of the heart, liver or kidneys, whilst many were in a state of advanced toxæmia. The amount of the agent used has varied from 1·1 to 15 grains.

Preparation and Restraint of the Subject.—Whilst it is considered advisable to withhold food on the day of operation, in many cases operation was an emergency measure and no preparation was carried out. When operation is anticipated the animal should be given a diet rich in carbohydrate—bread and milk, augmented by sugar, preferably glucose, for a few days prior to operation.

The vein selected is the recurrent tarsal vein, where it passes over the tibia, obliquely upwards and backwards, just above the lateral aspect of the hock. The left leg is used for the injection. The animal is restrained on its right side, hobbles being applied to both fore and the right hind limb, the hind limb being drawn well back. An assistant holds the left hind limb fully extended at right-angles to the vertebral column. His weight from the elbow is placed on the dog's hip; with his right hand he grips the leg above the stifle, his fingers being directed in front of the joint, but the thumb is pressed into the back of the gastrocnemius muscle to raise the vein. With the left hand the paw is firmly gripped, maintaining tension to ensure complete extension of the limb. The second assistant, whose important duty it is to gauge the depth of anæsthesia present, exerts pressure over the head and shoulders during preparation and the first part of the injection. If a tape muzzle is used to prevent the animal biting, it should be removed as soon as narcosis commences.

An area of suitable size over the vein is clipped closely. In the early part of this work the skin was shaved, but it is now considered adequate to clip closely. A clipping machine similar to that used by a hairdresser is employed. The prepared area is thoroughly cleansed with surgical spirit.

Preparation of the Material for Injection.—It is our practice to dissolve the drug in sterile water immediately prior to use. Some may prefer the sterile solution issued by the makers. The syringe used will depend upon the size of the dose, it being customary to employ a dilution of 1 grain to 1 c.c. An appropriate-sized syringe, however, should be used. If a 10 c.c. syringe is used for a 2 c.c. dose, the injection will be given too quickly for accurate assessment of the degree of narcosis to be carried out. When the doses have exceeded 10 grains, it has been our practice to increase the strength of the solution, making 10 c.cs. the maximum bulk of the injection. The needle employed is No. 22, 15 mm. intradermal needle (Arnold's), although for very small animals an even finer needle may be adopted. It is essential that it be in perfect condition.

The syringe, one or two needles, and a pair of dressing forceps, are sterilised by boiling in tap water for ten minutes. Excess water is poured off, and the steriliser set on one side to cool a little. The barrel of the syringe is removed from the steriliser with the forceps and the needle applied. The required amount of the drug is tipped into the syringe from capsules (capsules containing gr. 1½ and gr. ½ are supplied by the manufacturers), the plunger is inserted and the required amount of sterile water sucked into the syringe from the steriliser. Provided the water is of body temperature or above the nembutal quickly dissolves.

As regards the amount of drug to be used, it is essential that there shall be sufficient in the syringe to induce anæsthesia; at the same time, in view of the cost of the drug, one does not wish to be wasteful. Our practice is to compute the dose as though the intraperitoneal method of injection was being adopted, and add to it ½ grain for doses up to 4 grains, 1 grain for doses between 4 and 7 grains, and 2 grains for doses over 7 grains.

Technique of Injection.—The site chosen is the region where the vein passes over the tibia. In

the case of short-legged dogs, in which the skin of the limb is particularly flaccid, the skin is first drawn tense with the thumb of the left hand. In the case of long-legged animals this is unnecessary, for the traction placed upon the limb by the assistant serves to tense the skin. The needle (with the syringe attached) is thrust through the skin and into the vein along its long axis, in one movement. One endeavours to introduce the whole length of the needle up the vein. Occasionally the skin and subcutaneous tissue only are penetrated, in which case it is necessary to make a second thrust for the needle to enter the vein. Not infrequently the pressure of blood in the compressed vein is sufficient to force blood through the needle, into the syringe. If this does not occur, the plunger is slightly withdrawn. Provided the needle is in the vein blood will be very easily drawn back into the syringe. Should it be found difficult to withdraw the plunger, or on so doing should small bubbles of air (froth) appear in the liquid, this may be regarded as certain evidence that the vein is not penetrated. Having introduced the needle into the vein, the thumb and forefinger of the operator's left hand are used to encircle the limb, and grip the base of the needle firmly. This point is important, for it ensures that, should the animal suddenly jerk the limb upwards during the injection (a frequent occurrence), the needle will not be withdrawn from the vein. Immediately the injection is commenced the assistant gripping the limb eases the pressure over the vein. The site of the injection should now be carefully watched. Should injection cause any subcutaneous distension, this is certain evidence that it is being made into the subcutaneous tissue, and it should immediately be stopped. What generally happens in such a case is that the needle has transfixed the vein. Perivascular hæmorrhage makes it almost an impossibility to re-insert the needle at this point. When this error occurs (and in the early stages of our work it was by no means infrequent), the vein is again penetrated higher up, where it passes over the gastrocnemius muscle. Should one fail at this point, the other hind limb should be used.

After some experience we are now able, with certainty, to carry out an intravenous injection in long-legged dogs over 15 lb.; in fact, some of our subjects have been as small as 7 lb. In small, short-legged dogs such as the Pekingese, we admit frequent failures.

In human surgery great stress is laid upon the point that the injection shall be made slowly; Magill recommends a speed of 1 c.c. per minute. Our experience has confirmed Auchterlonie's statement that in the dog it can be made much more quickly with perfect safety. The first two-thirds of the injection are made comparatively quickly, in from ten to 30 seconds, according to the size of the dose. From this point we proceed slowly, with frequent stoppages whilst the degree of narcosis is being assessed, the remainder of the injection taking another one to one-and-a-half minutes. Having obtained anæsthesia, the needle is quickly withdrawn. The solution being entirely non-irritating, there is no necessity to withdraw blood into the syringe.

It is convenient at this point to state that in no case has any untoward complication, either local or systemic, attended the injection.

Estimation of the Degree of Anæsthesia.—Attention is directed to the following factors:—

(1) The onset of muscular relaxation—indicated by inability to raise the head, and loss of power in the lower jaw.

(2) The nature of respirations.

(3) Depression and loss of the corneal and pedal reflexes.

The onset of anæsthesia is not steadily progressive throughout the injection; it commences quite suddenly. During the injection of the first two-thirds of the necessary dose there is no appreciable change. At this point, it will generally be noticed that respirations, which up to now have been rapid, become at first "sighing," and then slow and shallow. At the same time, whilst the animal is able to raise its head sluggishly, it quickly allows it to fall again. From this point anæsthesia is rapidly progressive, and so injection is made slowly with frequent stops whilst the degree of anæsthesia is being assessed, chief attention being paid to the lower jaw. In light anæsthesia the jaw is completely relaxed (as also is the whole of the voluntary musculature), and the corneal and pedal reflexes, whilst present, are sluggish. It is this depth of anæsthesia which we find of great value for extensive examination of the mouth, pharynx and œsophagus; the extensive extraction of teeth in cases of gross alveolar periostitis. The persistence of swallow reflexes facilitates one's work and reduces the danger of a subsequent inhalation pneumonia occurring. For more extensive surgical interference, such as any laparotomy, we continue injection until deep anæsthesia is induced. It entails the use of but little more drug, 0·25 to 1 grain, for the margin between light and deep anæsthesia is small. The moment pedal and corneal reflexes are lost, deep anæsthesia is attained and injection must be stopped. Should light anæsthesia only be obtained for abdominal interference, it will be found necessary to augment it by ether when applying traction on the viscera.

Ability to assess the degree of anæsthesia present is quickly acquired with experience.

The quantity of the drug necessary to induce anæsthesia by this route in healthy dogs is fairly constant, and approximates closely the dose which we would compute for the intraperitoneal route. In cases of toxæmia there is often a

marked increase in susceptibility. The accompanying case records serve to illustrate these variations.

It is essential that anæsthesia shall be obtained, for, as is the case with most of the barbiturates in the dog, if sub-anæsthetic doses are used, the drug is most unsatisfactory. In such cases, in which narcosis only is induced, there is a tendency for the animal to become very noisy, indulging in almost continuous whimpering or barking; there is frequently quite violent struggling, whilst in occasional cases the animal becomes maniacal. This latter alarming symptom is especially liable to occur in greyhounds. We have found that if the drug is used in narcotic doses as an adjunct to inhalation anæsthesia by chloroform or ether, there is a marked tendency to struggling and excitement during the period of recovery. Our experience is that, provided full anæsthesia is attained, the period of recovery is not associated with excitement.

The induction of anæsthesia is so rapid by this method that there is no period of excitement during it; in fact, the transformation of an animal from the fully conscious (and often hyperæsthetic) state to one of complete anæsthesia in a period of one-and-a-half to two minutes is a most impressive surgical feat, especially when compared with the accepted course of induction with inhalation anæsthetics

Duration of Narcosis.—In typical cases anæsthesia is maintained at its original depth for a period of a half to one hour, sufficiently long for the majority of surgical interferences. After this, recovery slowly takes place. At the end of two-and-a-half hours the animal is generally able to raise the head, whilst in from five to nine hours it is able to sit up. Most of our surgical work is performed during the afternoon, and injections are made between 2.30 and 3.30. By 10 p.m. the same evening the animal is usually sitting up, whilst by 9 a.m. the following morning it is quite normal. An exceptional case will be encountered (particularly in very old subjects, or when a particularly large dose has been given), in which deep anæsthesia persists for four to five hours, and in which there is still evidence of narcosis after 18 hours.

In a few cases in which anæsthesia has been particularly deep, CO_2 by inhalation has been used as a stimulant to the respiratory centre. No other antidotal measures have been required. It is unnecessary to point out that care should be taken that there is no mechanical impediment to respiration during periods of deep anæsthesia.

No undesirable after-effects have been observed. In a series of 20 cases in healthy dogs, urine examination was carried out on the day after anæsthetisation, but no albuminuria was discovered.

In several cases nembutal anæsthesia has been induced twice in the same subject in a period of 14 days without ill-effect.

CONCLUSIONS

(1) The most rational and the safest method of inducing nembutal anæsthesia is by intravenous injection.

(2) In the majority of dogs no difficulty will be experienced in administration.

(3) Provided reasonable care is taken, no ill-effects will attend the injection.

(4) The rapidity with which general anæsthesia can be induced, even in very large subjects, and the entire absence of excitement during induction, make the method much superior to inhalation anæsthesia.

(5) The anæsthetisation of 132 routine surgical cases with only two deaths directly attributable to the agent is, it is considered, evidence that this is the safest form of anæsthesia in the dog. It is considered significant that, out of the four deaths which have occurred, using nembutal by all methods, three have been of the mouth-breathing type (Pekes and bulldogs). It is suggested that in these asphyxia may have been for the great part mechanical. It is advised that nembutal be not used in this type of dog.

DISCUSSION OF CASE RECORDS

On reviewing the case records given on pages 1467-1471 it will be seen that in healthy animals, in the great majority of cases, the dose found necessary to induce anæsthesia when injected intravenously approximates closely the dose recommended for intraperitoneal injection. Occasional irregularities occur, however, as seen, and Case No. 32 represents one in which the recommended dose would have provoked little or no response.

It will be observed that in some of our early cases we were inclined to underdose big dogs, being rather afraid to use doses over 10 grains. Subsequent results proved this fear to be unfounded, and since then doses up to 15 grains have been used.

In cases in which gross disease has been present great variations in susceptibility have been encountered, and in cases Nos. 18, 30, 44, 47, 48, 57, 72 and 75 it is likely that had the intraperitoneal method, computing dose by body-weight alone, been employed, alarmingly deep and perhaps fatal anæsthesia would have been induced; whilst in cases Nos. 9, 25, 51, 52, 60, 63, 69, 76 and 93 it is highly probable that such doses would have proved fatal.

Cases Nos. 36, 72, 76 and 84 serve to illustrate increase in susceptibility consequent upon prolonged fasting. In each, as the result of the presence of a foreign body in some part of the alimentary canal, the vomiting of food had greatly depleted the liver glycogen.

Case Records.

(*100 Cases*).

No.	Weight lbs.	Age. y-years, m-months.	Type and Sex.	Dose given. Grains.	*Recommended dose for intraperitoneal injection.*	Condition.	Operation.	Remarks.
1	7	3m.	Terrier M.	1·5	(*1·75*)	Healthy	Exploration œsophagus	Deep narcosis only. Injection spoiled by movement.
2	7	11y.	Pom. F.	1·1	(*1·75*)	Senile	Extraction of teeth ; removal mammary neoplasm	Deep anæsthesia 1½ hrs. Normal in 18 hrs.
3	8	3m.	Terrier M.	2	(*2*)	Healthy	Umbilical hernia	Deep anæsthesia 1 hr., narcosis 6 hrs.
4	8	4y.	Peke. F.	1·75	(*2*)	Fair	Enucleation eyeball	Deep anæsthesia.
5	8¼	6y.	Pom. M.	2	(*2*)	Toxic	See report ; drug lethal in this case.	
6	8½	5y.	Pom. M.	1·75	(*2·2*)	Fair	Oral sepsis. Extraction of teeth	Light anæsthesia.
7	8¾	3m.	Terrier M.	1·75	(*2·2*)	Healthy	Exploration œsophagus	Both veins used, deep narcosis only. Duration 6 hrs.
8	9	10y.	Pom. F.	2·25	(*2·25*)	Healthy	Removal mammary neoplasm	Deep anæsthesia.
9	9	8y.	Pom. M.	1·2	(*2·25*)	Gross cardiac disease	Oral sepsis : extraction of teeth	Light anæsthesia. Narcosis 6 hrs.
10	10	6y.	Pom. F.	1·75	(*2·5*)	Good	Removal mammary neoplasm	Light anæsthesia.
11	11½	11y.	Peke. F.	2·5	(*2·75*)	Toxic	Metrectomy : pyometra	Supplemented by ether when manipulating peritoneum. Anæsthesia 3 hrs., narcosis 7 hrs.
12	12	9m.	Terrier M.	2·5	(*2·75*)	Healthy	Re-break and set fractured radius	Deep anæsthesia 2½ hrs., narcosis 8 hrs.
13	12	6y.	Pom. M.	2·5	(*2·75*)	Fair	Oral sepsis : extraction of teeth	Deep anæsthesia 2 hrs., normal next morning.
14	12	3½m.	Terrier F.	3	(*2·75*)	Healthy	Ovaro-hysterectomy	Deep anæsthesia, narcosis for 6 hrs.
15	12	2y.	Peke. M.	2·75	(*2·75*)	Toxic	Enucleate septic eyeball	Deep anæsthesia, consciousness complete next morning. Died 3 days later. P.M.
16	14	7y.	Peke M.	2·75	(*3·25*)	Fair	Oral sepsis: extraction of teeth	Light anæsthesia.
17	14	3y.	Terrier M.	3	(*3·25*)	Toxic	Exploratory laparotomy (lymphadenitis i-c. gland)	Deep anæsthesia 1 hr. Normal next morning.
18	15	5m.	Sealyham M.	3	(*3·5*)	Poor (vomiting)	Exploratory laparatomy (nothing found)	Anæsthesia. Made good recovery.
19	15	10y.	Pom. F.	3	(*3·5*)	Good	Removal mammary neoplasm	Deep anæsthesia 1½ hrs.
20	15	12y.	Yorks. M.	3	(*3·5*)	Fair	Oral sepsis : extraction of teeth	Deep anæsthesia 2 hrs., followed by noisy narcosis. Normal recovery.
21	15	3y.	Terrier F.	3·5	(*3·5*)	Good	Hydrophthalmos : enucleate eyeball	Deep anæsthesia.
22	16½	11y.	Terrier F.	2·75	(*3·75*)	Poor	Oral sepsis : extraction of teeth	Movement spoiled inj. Noisy narcosis only.
23	17	4y.	Terrier M.	3·5	(*4*)	Toxic	Cystotomy for calculus	Deep anæsthesia. Normal recovery.
24	18	8y.	Pom. F.	3	(*4*)	Fair	Removal mammary neoplasm	Light anæsthesia.
25	18	3y.	Terrier F.	2	(*4*)	Very toxic	Metrectomy : pyometra	Deep anæsthesia 1 hr. Complete recovery.

No.	Weight lbs.	Age. y-years, m-months.	Type and Sex.	Dose given. Grains.	*Recommended dose for intraperitoneal injection.*	Condition.	Operation.	Remarks.
26	18	12y.	Terrier F.	3·5	(*4*)	Toxic	Metrectomy : dystocia	Deep anæsthesia, good recovery.
27	18	11y.	Pom. F.	3	(*4*)	Fair	Removal mammary neoplasm	Light anæsthesia.
28	18	1½y.	Terrier M.	3·75	(*4*)	Fair	Tracheotomy (stone in trachea)	Deep anæsthesia 1½ hrs. Recovery 8 hrs. Was given 3·5 grains by intraperitoneal inj. 48 hrs. before.
29	18	13y.	Mongr. M.	4·5	(*4*)	Poor	Carcinoma, prepuce	Large dose given. Very deep anæsthesia for 8 hrs. CO_2 administered. Normal in 24 hrs. Later destroyed by request.
30	19	10y.	Mongr. M.	3·25	(*4*)	Fair	Hydrophthalmos : enucleate eyeball	Deep anæsthesia, normal recovery.
31	19	11y.	Mongr. M.	3·5	(*4*)	Fair	Oral sepsis : extraction of teeth	Light anæsthesia.
32	20	4½y.	Terrier M.	6·5	(*4·5*)	Good	Examination pharynx	A particularly large dose. Deep anæsthesia, normal recovery.
33	20	4y.	Aberdeen F.	4.5	(*4·5*)	Fair	Necrosis digits ; amputation through tibia	Deep anæsthesia, normal recovery.
34	20	10y.	Terrier M.	4	(*4·5*)	Fair	Oral sepsis : extraction of teeth	Deep narcosis only.
35	20	3y.	Terrier F.	4	(*4·5*)	Toxic	Enucleation, suppurating eyeball	Deep anæsthesia, narcosis for 6 hrs. Normal recovery.
36	21	9m.	Terrier M.	3·5	(*4·5*)	Fair	Gastrotomy for foreign body (rubber ball)	Deep anæsthesia, CO_2 given. Normal recovery.
37	22	7y.	Mongr. F.	4·5	(*4·75*)	Toxic	Metrectomy : pyometra	Deep anæsthesia 1½ hrs., narcosis 5 hrs. Normal recovery.
38	22	6y.	Terrier F.	4·5	(*4·75*)	Good	Chronic mastitis. Removal gland.	Good anæsthesia.
39	23	5y.	Terrier M.	4·5	(*4·75*)	Uræmic	Urethrotomy for calculi	Deep anæsthesia, normal recovery.
40	23	4y.	Mongr. F.	5	(*4·75*)	Good	Cæsarian section through inguinal hernia	After ½ hr., anæsthesia augmented by ether by inhalation whilst manipulating peritoneum. Narcosis for 2 hrs. only. Normal recovery.
41	23½	1¼y.	Terrier M.	4·5	(*4·75*)	Fair	Gastrotomy, foreign body (rubber ball)	Good anæsthesia, normal recovery.
42	23½	1¼y.	Terrier M.	4·5	(*4·75*)	Fair	Gastrotomy, foreign body (stone)	Deep anæsthesia.
43	24	11y.	Terrier F.	5	(*5*)	Very fat	Removal large lipoma, sternum	Good anæsthesia, narcosis ended in 4 hrs.
44	24	12y.	Mongr. M.	4	(*5*)	Fair	Oral sepsis : tooth extraction	Light anæsthesia.
45	24	6y.	Terrier M.	5	(*5*)	Good	Tooth extraction	Light anæsthesia, narcosis 9 hrs.
46	25	4y.	Terrier M.	4·75	(*5·25*)	Healthy	Reduction luxated hip	Deep narcosis, whimpering during reduction.
47	25	15y.	Mongr. F.	4·5	(*5·25*)	Toxic	Suppurating mammary neoplasm	Deep anæsthesia 2 hrs. Narcosis 24 hrs. Normal recovery.
48	25	6y.	Terrier F.	4·5	(*5·25*)	Toxic	Cystotomy for calculi	Deep anæsthesia.

No.	Weight lbs.	Age. y-years, m-months.	Type and Sex.	Dose given. Grains.	*Recommended dose for intraperitoneal injection.*	Condition.	Operation.	Remarks.
49	25	Adult	Terrier M.	4·5	(*5·25*)	Healthy	Gross injury to digits (street accident) amputation limb through tibia	Deep anæsthesia.
50	25	12y.	Mongr. M.	5	(*5·25*)	Good	Carcinoma, skin external ear	Light anæsthesia 1½ hrs. Narcosis 6 hrs.
51	25	3y.	Mongr. F.	3·5	(*5·25*)	Toxic	Metrectomy : pyometra	Deep anæsthesia, normal recovery.
52	25	5y.	Terrier F.	3·5	(*5·25*)	Very toxic	Metrectomy : pyometra	Deep anæsthesia, normal recovery.
53	27	8y.	Terrier F.	5	(*5·5*)	Very fat	Cystotomy : calculi	Good anæsthesia, raising head in 2½ hrs.
54	29½	4y.	Spaniel F.	6	(*6*)	Healthy	Enucleation suppuratory anal gland	Deep anæsthesia for 2 hrs., narcosis 9 hrs.
55	30	9m.	Mongr. M.	5·5	(*6*)	Good	Lipoma, chest wall	Deep narcosis only, augmented by ether.
56	33	6m.	Alsatian M.	6	(*6·25*)	Healthy	Parotid cyst	Deep anæsthesia, narcosis 10 hrs.
57	35	6y.	Spaniel F.	5·5	(*6·5*)	Healthy	Street accident. Amputation 3 digits	Deep anæsthesia, narcosis 5 hrs.
58	35	2y.	Spaniel F.	6	(*6·5*)	Healthy	Pus in antrum, extraction of carnassial tooth	Light anæsthesia.
59	35	2y.	Mongr. M.	6·5	(*6·5*)	Healthy	Reduction luxated hip	Deep anæsthesia.
60	36	12y.	Spaniel F.	5	(*6·5*)	Toxic	Exploratory laparotomy	Deep anæsthesia 2¾ hrs., narcosis 9 hrs.
61	36½	1¼y.	Mongr. M.	5·75	(*6·5*)	Healthy	Parotid cyst	Deep narcosis augmented by local anæsthesia.
62	37	2y.	Mongr. M.	6·5	(*6·75*)	Healthy	Exploration mouth and pharynx	Deep anæsthesia 1 hr., narcosis 9 hrs.
63	39	6y.	Mongr. M.	5·75	(*7*)	Toxic	Acute local abscess submaxillary gland	Light anæsthesia.
64	40	5y.	Mongr. M.	6·5	(*7*)	Good	Amputation digit	Good anæsthesia.
65	41	6y.	Mongr. M.	6·5	(*7*)	Toxic	Fistula, submaxillary region	Deep anæsthesia 4 hrs., hyperæsthetic during recovery. (Had nembutal by i/p. injection 14 days before.)
66	42	8y.	Mongr. F.	7·5	(*7·25*)	Toxic	Metrectomy : pyometritis	Light anæsthesia, augmented by ether during manipulation of peritoneum. Narcosis 7 hrs.
67	45	10y.	Chow M.	6·5	(*7·5*)	Uræmic	Urethrotomy for calculi	Very deep anæsthesia. CO_2 and artificial respiration. Anæsthesia 3 hrs., narcosis 8 hrs. Died 2 days later, P.M. Bilateral hydronephrosis.
68	45	2y.	Chow F.	7·5	(*7·5*)	Toxic	Metrectomy : pyometra	Light anæsthesia, augmented by ether during manipulation peritoneum. Duration narcosis 6 hrs.
69	47	6y.	Elkhound F.	6	(*7·75*)	V. toxic. In labour 30 hrs.	Cæsarian metrectomy	Deep anæsthesia, artificial respiration applied. Recovered from narcotic 12 hrs. Died in 24 hrs. from acute toxæmia.

No.	Weight lbs.	Age. y-years, m-months.	Type and Sex.	Dose given. Grains.	*Recommended dose for intraperitoneal injection.*	Condition.	Operation.	Remarks.
70	47	7y.	Mongr. M.	8	(*7·75*)	Good	Seminoma, testicle	Light anæsthesia, hyperæsthetic during period of recovery (6 hrs.).
71	48	9y.	Collie F.	7·5	(*7·75*)	Good	Amputation digit : melanotic sarcoma	Deep narcosis only, augmented by local anæsthesia.
72	48	9y.	Chow F.	5·5	(*7·75*)	Very toxic	Dystocia, whelping 4 days. Cæsarian metrectomy	Deep anæsthesia 1 hr., narcosis 4 hrs. Died 3 days later, peritonitis.
73	50	2½	Spaniel M.	7·5	(*8*)	Uræmic	Urethrotomy for calculi	Deep anæsthesia 3 hrs., normal recovery.
74	50½	8y.	Mongr. M.	7·5	(*8*)	Good	Epithelioma, skin shoulder	Deep anæsthesia.
75	55	7y.	Mongr. M.	7	(*8·5*)	Good, very fat	Hæmatoma, head	Light anæsthesia.
76	58	1y.	Mongr. M.	6·5	(*8·75*)	Toxic	Intestinal obstruction (silk stocking)	Deep anæsthesia, narcosis for 5 hrs. Dog destroyed 14 days later, having developed canine distemper.
77	63	3y.	Bullterrier M.	9·5	(*9·25*)	Good	Fistula, prepuce	Good anæsthesia, narcosis 6 hrs.
78	65	9y.	Sheepdog F.	10	(*9·75*)	Good	Mammary neoplasm	Light anæsthesia, supplemented by ether after 15m. Narcosis 10 hrs.
			In the following cases the animal was not weighed but the breed serves to indicate the size.					
79	—	13y.	Airedale F. (small)	7	—	Good	Operation : mammary neoplasm	"Muffed" injection —dose too small, caused noisy narcosis ; anæsthesia completed with ether. One of our early cases.
80	—	6y.	Airedale M. (medium)	9	— —	Good	Enucleation suppurating anal gland	Deep narcosis only, supplemented by ether. Another early case in which we were afraid of overdosing.
81	—	—	Same dog	11	—	Good	Operation on 2nd gland 1 month later	Continued injection to deep anæsthesia. Narcosis 6 hrs.
82	—	11y.	Airedale F. (large, fat)	8·5	—	Good	Mammary neoplasm	Narcosis only. Another early case, fear of overdosing.
83	—	—	Same bitch	14	—	Good	Second operation 3½ months later	Injection continued to deep anæsthesia. Narcosis 8 hrs. normal recovery.
84	—	6y.	Airedale M. (large)	7	—	Almost a skeleton, had not retained solids for 21 days	Œsophagotomy. Intrathoracic obstruction by bone	Deep anæsthesia, narcosis 7 hrs. Normal recovery.
85	—	8y.	Airedale M. (medium, fat)	10	—	Good	Furunculosis	Light anæsthesia, normal recovery.
86	—	2y.	Airedale M. (large)	13	—	Good	Gastrotomy, foreign body (rubber ball)	Good anæsthesia.
87	—	8y.	Airedale M. (large)	13·5	—	Fair	Amputation digit: melanotic neoplasm	Deep anæsthesia.
88	—	11y.	Airedale F. (small)	8·5	—	Poor	Mammary neoplasm	Deep anæsthesia.

No.	Weight lbs.	Age. y-years, m-months.	Type and Sex.	Dose given. Grains.	*Recommended dose for intraperitoneal injection.*	Condition.	Operation.	Remarks.
89	—	1y.	Alsatian M. (small)	9	—	Good	Fistula, sternum	Light anæsthesia, supplemented later by local.
90	—	3½y.	Alsatian F. (medium)	10	—	Toxic	Metrectomy : pyometra	Deep anæsthesia, narcosis 7 hrs., normal recovery.
91	—	6y.	Alsatian F. (large, fat)	15	—	Good	Melanotic neoplasm right eye. Enucleation	Deep anæsthesia, rapidly recovering 2½ hrs.
92	—	3y.	Mastiff M.	9	—	Toxic	Cystotomy for calculi	Narcosis only, supplemented by chloroform. An early case.
93	—	4y.	St. Bernard F.	12	—	Very toxic	Dystocia 40 hrs., cæsarian hysterectomy	Deep anæsthesia, narcosis for 6 hrs. Died 18 hrs. later toxæmia.
94	—	12y.	Mongr. M. (est. weight 55 lbs.)	7·25	—	Good. Fat.	Oral sepsis: extraction of teeth	Light anæsthesia.
95	—	6y.	Peke F. (fat) (est. weight 14 lbs.)	3·25	—	Toxic	Suppurating panophthalmitis	Died 4m. after injection from cardiac failure (see report).
96	—	4y.	Pom. M. (est. weight 22 lbs.)	4·25	—	Chronic nephritis	Oral sepsis: tooth extraction	Light anæsthesia. Narcosis 7 hrs.
97	—	10y.	Mongr. M. (est. weight 25 lbs.)	4·5	—	Fair	Neoplasm, skin hind leg	Deep narcosis only, supplemented by ether. Narcosis 5 hrs.
98	—	10y.	Mongr. M. (est. weight 60 lbs.)	10	—	Fat	Removal of scrotum for neoplasm	Deep anæsthesia ½ hr., followed by noisy narcosis. Some narcosis for 24 hrs.
99	—	6m.	Terrier M. (est. weight 13 lbs.)	3·25	—	Healthy	Examination for fracture, neck of femur	Light anæsthesia.
100	—	7y.	Terrier M. (est. weight 35 lbs.)	6	—	Very fat	Operation hæmatoma external ear	Deep anæsthesia, lightening after ½ hr. Some narcosis for 24 hrs.

Cases Nos. 9, 25, 51, 52, 69, 72, 84 and 93 illustrate the safety of the drug as a general anæsthetic. In each disease was advanced, but in none did death during anæsthesia result; in fact, in the whole series, despite surgical interference, only five animals subsequently died.

These records indicate that age, provided the animal is healthy, does not appear greatly to increase susceptibility. In 23 of the 100 cases recorded in detail, the ages of the animals were from ten to fifteen years.

We wish to acknowledge the help we have received from Messrs. J. S. Paterson, D. L. Hughes and L. Lester, who have worked with us for periods, whilst carrying out these observations.

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SCOTTISH PRODUCERS OF HIGH GRADE MILK

Intimation was made at a largely attended general meeting in Glasgow of members of the Certified and Grade "A (T.T.) Milk Producers' Association that, in the event of their complaint regarding the operation of the Scottish Milk Marketing Scheme being remitted to the Committee of Investigation, the Board would be prepared to grant an amendment of the Scheme.

The complaint has now been referred to the Committee by the Secretary of State for Scotland, and the amendments proposed by the Board are:—

(1) The contribution payable on sales of certified milk to be reduced to 1d. per gallon all the year round;

(2) A reduced contribution to be operated as from October 1st, 1934; and

(3) The Board to give minimum price protection to sales of certified milk.

The demands put forward by the Association, however, go beyond these concessions, and ask for a complete exemption for sales of milk sold as certified milk.

Clinical Communications

FATAL PARASITIC ENTERITIS AMONG RAZORBILLS

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A number of razorbills (*Alca torda*) were recently picked up dead on the Littleton reservoir of the Metropolitan Water Board, near Staines, Middlesex. One of the birds was sent by Mr. J. Stilgoe to the British Museum (Natural History) for examination with a view to ascertaining the cause of its death, and was received in a fairly fresh condition on October 27th. Through the kindness of Dr. W. Rushton and of Mr. Stilgoe, 14 more were received on October 29th.

The first bird was thoroughly examined for internal parasites. The others could not be dealt with until the morning of October 30th, by which time the condition of most of them was not very good, and no attempt was made to examine them very thoroughly. The rectal portion of the intestine, however, was examined and found to be in the same condition in every individual. The last five or six inches of the gut appeared to be highly inflamed, and on being opened was seen to be full of blood, while attached to its lining were enormous numbers of Holostomes, or Strigeid flukes. So copious was the hæmorrhage that in many cases blood spurted from the vent when the skin of the abdomen was cut with a scalpel. The number of Holostomes present in one bird was estimated at about 1,000. In some cases a few of them had invaded the cæca.

On examination the flukes were determined as *Cotylurus platycephalus* (Creplin, 1825) Szidat, 1929. This species does not seem to have been recorded previously in the razorbill. It was originally found by Creplin in the bursa Fabricii of the red-throated diver (*Colymbus stellatus*), and has been recorded from the same situation or in the cloaca of several other birds—gulls (*Larus ridibundus, L. canus*), a tern (*Sterna hirundo*), a skua (*Stercorarius parasiticus*) and the black guillemot (*Uria grylle*). The closely-related species *Cotylurus variegatus*, which inhabits the small intestine of its hosts, has, however, been recorded from *Alca torda*.

In several of the birds there was evidence of successive infections with *Cotylurus*, since worms of various sizes were found together in the same individual. There can be no doubt that the excessively heavy infestation with these parasites was the primary cause of the death of the birds. According to the observations of Szidat (1929), Strigeids feed at the expense of their hosts, partly on blood and partly on the altered tissue of the mucous membrane. With the powerful sucking and clinging apparatus formed by the modified anterior portion of the body, they attach themselves firmly to a portion of the mucosa. The capillary blood-vessels of the villi become engorged and burst, and some of the blood thus liberated is absorbed by the worms. Later a degeneration of the cellular elements of the mucosa sets in, probably as the result of a process of external digestion by the secretion of certain glands in the clinging organs of the worms. The epithelium is thus transformed into a kind of liquid food which can be assimilated by the parasites. The extensive hæmorrhage observed in nearly all the birds in the present case suggests that the infections were of approximately the same age and had been recently acquired.

An account has been given by Bittner (1927) of a fatal enteritis, due to Strigeid worms, in two domestic pigeons purchased in the market of Sofia. The worms were determined as *Cotylurus cornutus*. The pigeon is not a normal host for this species, which occurs in plovers and ducks. The severity of the symptoms, both in Bittner's and in the present case, may possibly be attributed in part to the infection having been accidentally acquired by hosts to which the parasites were imperfectly adapted.

The life-history of *Cotylurus platycephalus* does not appear to be known. The "Tetracotyle" larva of the closely-related species *C. cornutus* occurs, according to several observers, in freshwater snails, and, according to Szidat, also in leeches inhabiting fresh water. The larva of *C. variegatus* is said to occur in the ruffe (*Acerina cernua*) and possibly in other freshwater fishes, and the second intermediate host of an American species, *C. communis* (Hughes), is also a freshwater fish. Other larval forms of the "Tetracotyle" type are known to occur in various freshwater and terrestrial hosts, but nothing appears to be known of the occurrence of such larvæ in marine fishes, which would form the normal diet of the razorbill.

In addition to the *Cotylurus*, three other species of parasitic worms were found in the razorbills—two Trematodes and a Cestode.

(1) *Diplostomum* [*Hemistomum*] *pileatum* (Brandes, 1888).*

This species occurred in the intestines of the only three birds which were fully examined. It has been recorded by Nicoll from a razorbill examined at the London Zoological Gardens, and its occurrence has also been reported in various other aquatic birds (terns, gulls, divers, grebe, merganser, stork). The intermediate hosts of

* The correct name of this form is probably *Diplostomum pileatum* (Brandes), though this combination of names does not seem yet to have been used.

D. pileatum are unknown, but the "Diplostomulum" larvæ of closely-related species occur in freshwater (not marine) fishes.

(2) *Metorchis xanthosomus* (Creplin, 1846).

The gall-bladders of all the birds were examined, and this parasite was found in all except four of them. It has been recorded by Nicoll from the razorbill, and is known also from various species of ducks, divers and grebes. The intermediate hosts are unknown, but the larvæ of two other species of the genus *Metorchis* are said to occur in freshwater fishes.

(3) *Ligula intestinalis* (L., 1758).

Cestodes were not looked for in most of the birds, but were present in at least two of them, and proved on examination to belong to this species. This worm does not seem to have been recorded from the razorbill, but is known to occur in a large variety of fish-eating birds, including grebes, mergansers, divers, gulls and terns. Its first intermediate hosts are freshwater Copepods (*Cyclops* and *Diaptomus*), its second intermediate hosts various freshwater fishes, chiefly Cyprinidæ. It is not known in marine fishes.

It will be noticed that all the four species of parasites found in the razorbills are forms which, it may reasonably be assumed, the birds must have acquired by feeding on freshwater fishes. It was at first thought that their heavy parasitic infection, with the consequent loss of blood and weakness, had led to the birds having been carried inland by a gale which occurred shortly before they were picked up. In view of the parasites found, however, a different theory seems more probable, *viz.* that, having for some reason or other left the sea, the birds had been feeding on freshwater fish for some time, thereby acquiring infection with a series of parasites that were not normal to them. These parasites (especially the *Cotylurus*) probably produced more serious effects upon the birds than they would have had on their more usual hosts. There was, in fact, a rapidly fatal epidemic of parasitic enteritis, which wiped out all the birds. The fact that the alimentary canals of the birds contained no recognisable remains of food probably means only that in consequence of their sickness they had ceased to feed. They were still in fat condition, and it cannot be assumed that they had not fed since their arrival on inland waters. Moreover, the parasites had had time to grow to maturity, and must therefore have been acquired some days at least before the death of the birds.

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PTERYGIUM IN THE DOG

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The subject was a male wire-haired terrier, about four months old.

The owner reported that it had "hairs in its eye," which he had only just noticed, and suspected were hairs displaced from the coat.

Examination showed a small pterygium on the conjunctiva, near the outer canthus. Conjunctivitis was not very marked, nor, according to the owner, had it been long existent.

The growth was dissected off, and healed uneventfully and satisfactorily.

The interesting point about this case is that this puppy's sire was operated on by me for entropion as a puppy, after which it did well in the show ring, and before it was sold and left this neighbourhood was used at stud.

Nearly all this animal's progeny have required to have the entropion operation performed, and one, as recorded, had a pterygium. I have been unable to obtain any information as to the state of the eyes of this dog's progeny since he left this neighbourhood, but judging from what I have seen here, I am inclined to think that wire-haired terrier breeders possibly are laying a little too much emphasis on smallness of eye as a point.

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TERATOMA IN A SHIRE GELDING

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About two years ago I was called to a nine-year-old bay shire gelding with "stoppage."

The routine rectal examination revealed a large, very solid (but not hard) mass on the floor of the pelvis, in a place corresponding to the site of the pelvic flexure of the colon.

The usual treatment was applied, supplemented during five days with all sorts of laxatives, stimulants, etc., without avail. The horse kept having spasms of pain intermittently, and the mass still remained *in situ*.

As I had then come to the conclusion that one had some sort of calculus to deal with, the gelding was destroyed.

Post-mortem revealed a large body in the pelvic flexure of the colon, the size of a football, nearly spherical, and weighing 12 lb. 14 oz. With the exception of an area as large as the base of a teacup, it was covered with what appeared to be mucous membrane.

Further examination revealed that the suprasternal flexure of the colon was adherent to the diaphragm. On dissecting into this, an area denuded of mucous membrane, exactly the size of the uncovered area of the mass, was revealed. This was stained by fæces, but washing and scraping distinctly showed that the floor of this area was composed of muscle tissue.

The mass was then cut into; its interior was composed of:—

(1) Cavities containing black hair.
(2) Bone, in pieces up to about two inches in length, of various shapes, and cartilaginous.
(3) Very distinct tooth material.
(4) Muscle tissue.
(5) Large pockets of a greyish, caseous material of the consistence and smell of bloater paste.
(6) Covering, smooth and glistening, exactly like intestinal mucous membrane. This had undergone erosion in one or two places, ulcers as big as a penny-piece being evident, the floors of which were roughened and stained with fæcal pigment.

In my opinion this unusual teratoma "budded off" from the diaphragm: adhesions formed between the supra-sternal flexure of the colon and the diaphragm as the result of this process, and the teratoma "grew" into the lumen of the colon, invaginating the intestinal wall, which accommodated itself to the growing mass. This increased in size, becoming spherical under the resistance of the intestinal wall. Finally, the weight of the mass became too heavy for the comparatively thin pedicle, which broke, and the mass became detached in the intestine, finally to become obstructed on its way to the outer world in the pelvic flexure.

The horse, when first seen by me, was in poor condition, and the owner reported that it had not been doing well for some months before it was destroyed.

. . . . . .

I enclose a photograph of a six-months-old foal with an incisor tooth in the middle of its face. I have on two occasions removed rudimentary molar teeth from the temporal fossa of horses.

This tooth is clearly an incisor tooth and appears perfect. This foal now has four incisor teeth up in their normal positions in the jaws.

ELECTRIC METHODS OF PRODUCING HUMANE SLAUGHTER

The above was the subject of the thirteenth annual Benjamin Ward Richardson Memorial Lecture of the Model Abattoir Society, delivered by Sir Leonard Hill at the Royal Sanitary Institute on November 27th.

Sir Leonard Hill (whose important lecture will be dealt with in the abstracts section of an early issue of this journal) said that Richardson founded the Model Abattoir Society in 1882, but as early as 1869 he was experimenting with electrocution as a method of slaughtering. His great aim was to secure narcosis by this means or by inhalation of some lethal gas before the "sticking" of animals was carried out. He would therefore have welcomed the advent of electric stunning instruments, their use being safe, and free from all the objections urged against shooting.

Sir Leonard denied the assertion sometimes made that the electrical method, as now practised, results only in a condition of muscular spasm and inability to move. The spasms, which might be concomitant effects of an incomplete anæsthesia, could be avoided by a steady increase of the strength of the current. Moreover, spasms resulted when an animal was shot with the captive bolt, but no one inferred that they were then signs of consciousness.

A further denial was given by the lecturer to the statement that the electrical method of producing narcosis causes congestion and œdema of the brain and tissue changes which precede the bleeding of the animal to death by cutting its throat. Against this, said Sir Leonard, was the fact that animals could be anæsthetised by means of electric stunning instruments for a short period and recovered completely and behaved as normal animals again. Operations could be performed on animals with no other anæsthesia than that of the electro-lethaler, the application of this being made in successive doses, as needed, just as was done with chloroform.

Pigs were easily and perfectly anæsthetised by the electric process and subsequently hoisted and bled without struggle or squeal; in the case of cattle, the current should be applied for about 20 seconds and an electric stunner could very well be combined with the use of the pole-axe and the cane, for a beast sank to its knees immediately the electric tongs were applied between the eye and ear.

Abstracts

[Swine Fever: Active Immunisation. Michalka, J. (Federal Institute for Control of Animal Diseases, Mödling, Vienna, Austria). Paper No. 49, Twelfth Internat. Vet. Congress, New York, 1934. *Author's Summary.*]

Direct active immunisation against hog cholera has recently received a new impetus through the use of formolised vaccines prepared from the organs of hog-cholera-infected swine (Terakado and Michalka). Experimental tests of these vaccines have shown them to possess relatively high but not absolutely protective value. In practice they are successfully used principally for prophylactic vaccination in healthy herds and for the control of chronic hog cholera in shoats.

Simultaneous vaccination is the most reliable method at the present time for controlling an outbreak of hog cholera rapidly and with a minimum of loss. In the application of simultaneous vaccination all animals in the herd, including pregnant and nursing mothers as well as suckling pigs, must be immunised. Pregnant animals abort occasionally, but for the most part deliver at term. Litters from dams vaccinated during advanced pregnancy may succumb to hog cholera (intra-uterine infection); they may be saved, however, through early simultaneous vaccination, preferably at the age of two weeks.

Suckling pigs of all ages withstand the simultaneous vaccination very well and acquire an immunity of sufficient duration provided a virus of high virulence and good antigenic properties is used.

Simultaneous vaccination with increased serum doses offers the following advantages: Vaccination reactions either are lacking or occur abortively in one or two days; therefore vaccination losses of animals, healthy at the time of inoculation, are almost completely avoided. Healthy animals and even those showing an elevation of temperature can be saved to the extent of almost 100 per cent. if their appetite is unimpaired at time of vaccination; others can be saved to the extent of almost 50 per cent. if the loss of appetite is of only one or two days' duration. The problem of virus carriers in this method of vaccination is practically of no importance.

The excretion of virus is terminated in 21 to 28 days at the latest if high doses of a potent serum and corresponding virus are used. The danger of establishing permanent carriers through simultaneous vaccination is slight under practical conditions.

The leaving of virus carriers must be feared only if the vaccination reactions are abnormally strong and especially if their course is abnormally long; in other words, if the intensity of the inoculation disease is low. Animals which remain stunted in growth after simultaneous vaccination become virus carriers in a high percentage of cases.

Sucklings of immune dams appear to be immune to artificial infection during the nursing period, in a high percentage of cases.

The commercial production of anti-hog-cholera serum and hog-cholera virus should be placed under Government control in all countries. The simultaneous vaccination should be carried out according to uniform principles by specially trained veterinarians with experience in the control of hog cholera.

A standardisation of the methods of titration of anti-hog-cholera serum in accordance with strictly quantitative principles would be highly desirable. A minimum titre of 0·5 c.c. per kg. of body-weight should be required of every commercial serum, at the present time.

The virus used in simultaneous vaccination must possess not only high virulence but also corresponding antigenic properties; its value can be primarily ascertained through tests of duration and intensity of the immunity produced in simultaneously vaccinated animals.

Veterinary-police measures are effectively supported by simultaneous vaccination. On the other hand, simultaneous vaccination without veterinary-police measures constitutes a great danger of the further spread of hog cholera.

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[Simultaneous Inoculation Against Hog Cholera. Dorset, M. (Chief, Biochemic Division, Bureau of Animal Industry, United States Department of Agriculture, Washington, D.C., U.S.A.). Paper No. 28, Twelfth Internat. Vet. Congress, New York, 1934. *Author's Summary.*]

The preponderance of evidence is against the contention that immunity in hog cholera is due to a permanent infection with the virus. The discordant opinions regarding the simultaneous inoculation and its after-effects are probably caused by a lack of agreement as to the principles involved. The author maintains that a careful adjustment of the serum and virus is not necessary, since the needed response takes place even when the dose of serum is greatly in excess of the amount required to prevent the development of visible symptoms in the inoculated animal. The success of the simultaneous inoculation in the United States, where more than 300,000,000 pigs have been inoculated in the last 20 years, is believed to be due to the administration of a virus of high virulence with a "plus" dose of serum.

[**Anærobe Infections of the Domesticated Animals in Dutch Java, with especial reference to a Specific Osteomyelitis in the Buffalo.** Kraneveld, F. C. (Bacteriologist, State Veterinary Institute, Buitenzorg, Dutch Java). Paper No. 8, Twelfth Internat. Vet. Congress, New York, 1934. *Author's Summary.*]

Among the infectious diseases which occur in the Dutch East Indies and which are caused by anærobic bacilli, blackleg occupies the first place. This disease, principally found in cattle, but in some instances noticed also in buffaloes, occurs to a considerable extent, predominantly in certain low-lying districts with chalky soil in Central and East Java and also on the Island of Madura. In addition, infections by the para-blackleg bacillus and by Fränkel's gas œdema bacillus are known. These bacilli, however, are very often found as secondary infections in cases of blackleg (high external temperatures).

An interesting disease which, as far as it is known, has occurred only in the Dutch East Indies, is a bacillary osteomyelitis (osteomyelitis bacillosa bubalorum) in the Indian buffalo (*Bos bubalus* var. *sundaicus*, Kerabau). This disease at present occurs only in Sumatra, but formerly cases were found also in Java and Borneo. Most cases are of a sporadic nature, but the disease may sometimes assume an enzoötic character.

The clinical aspects are those of a mild to serious chronic lameness. In some instances, intermuscular and intramuscular abscesses can be found clinically. General symptoms are of subordinate importance.

The disease, which can be cured in its early stage, has the following characteristics:—

Necrobiosis of the bone marrow, necrosis and demarcation of certain parts of the bones, formation of a slough. Complications may occur, such as fissures, fractures, dislocations, a complete loosening of the epiphyses, etc. In many instances the spread of the process is halted by the epiphyseal lines by which the epiphyses and the bordering links, except the hip joint, are not affected by the process. Now and then serous and serofibrinous arthritides are noticed. Following the necrosis, there is a heavy pus formation with effusions from within the bones chiefly near the epiphyseal lines. On account of the epiphyseal line of the femur lying within the hip joint, the latter is often affected by the process in case of an infection of the femur. Following these effusions, there develop, in the beginning, subperiosteal and later intramuscular and intermuscular abscesses, which may spread even as far as under the skin. This may be followed by a perforation (formation of a fistula).

Of the large tubular bones, the femur and humerus are chiefly affected; the tibia rarely. In a few cases processes have been noticed in the ribs, vertebræ and pelvis.

In the parts affected, regularly and almost exclusively an anærobic bacillus is found which coincides morphologically and culturally with *B. gigas* (Zeissler and Rassfeld). It is distinguished from the latter inasmuch as it completely lacks pathogenicity. Even if the bacillus isolated should exhibit, in further investigations, some serological differences from *B. gigas*, there are sufficient reasons to include it in the "Novy group" proposed by Miessner, Meyn and Schoop.

Experiments at artificial transmission have been unsuccessful.

Considering the results of some experiments of infection and also of observations in nature, one must think seriously of an infection *per os* in which intestinal disorders may be a predisposing cause. In all probability, there are still other predisposing factors (trauma, anæmia, chronic blood diseases, etc.) which cause osteomyelitis and which influence the local resistance of the marrow or the general powers of resistance.

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[**Leukæmia of Fowls.** Stubbs, E. L. (Professor of Veterinary Pathology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, U.S.A.). Paper No. 7, Twelfth Internat. Vet. Congress, New York, 1934. *Author's Summary.*]

The term "leukæmia" in the fowl is commonly used to include diseases that show little or no blood alteration as well as those that show a definite blood change. Fowl leukosis is used to include leukæmia and leukæmia-like diseases. This group of diseases is becoming more important with the expanding poultry industry and the increasing number of obscure conditions encountered by those interested in poultry diseases.

Erythroleukosis is a transmissible disease of chickens characterised by severe anæmia with numerous lymphoid cells and basophil erythroblasts, presumably precursors of erythrocytes found in the peripheral circulation. Similar cells show a selective accumulation in the capillaries of the bone marrow, liver, spleen, and sometimes in other organs.

Myeloid leukosis appears to begin with a tumour-like proliferation of the myeloblastic and myelocytic elements of the bone marrow. Later the blood is invaded with large numbers of myeloid forms and the terminal stage shows foci of myeloid cells in the liver. The character of the cells, the blood picture, and the characteristic bone-marrow hyperplasia leave no doubt in most cases as to its being leukæmia. Blood counts show a large number of white cells, and the ratio of white cells to red cells, instead of

being 1 to 100 as in the normal chicken, becomes 1 to 2, or in some instances the number of white cells exceeds the number of red cells.

Lymphoid leukosis is the condition in which there is a marked cellular infiltration of tissues, particularly the liver and spleen. The infiltrating cells are like large lymphocytes and may be in the form of circumscribed or diffuse invasions.

Erythroleukosis and myeloid leukosis are readily transmissible by injections of blood, blood cells, organ suspensions or extracts, and even filtrates of such substances. Following injection, either type of leukosis may appear. Thus injections from a chicken affected with erythroleukosis into normal chickens may result in erythroleukosis or in myeloid leukosis, or a mixture of the two types. The two types are closely related and apparently are due to the same cause.

The period of incubation varies from twelve days to four months. The first noticeable symptom is paleness, most marked about the comb and wattles. Frequently the skin bleeds easily and particularly where the feathers are rubbed or pecked. Necropsy shows hæmorrhages scattered through the muscles of the breast and thighs. The liver is swollen as are the spleen and bone marrow.

Baby chicks, older chicks, young chickens and old chickens were tested and all found to be susceptible. The younger the chicken the higher the susceptibility as measured by the period of incubation, the percentage of successful inoculations and the mortality.

Six groups of chickens, including Barred Plymouth Rocks, White Leghorns, Rhode Island Reds, mixed breeds, bantams, and "naked necks" were tested and each found to be susceptible, indicating that all breeds of chickens are susceptible to leukosis.

Various species of fowls other than chickens were tested, including guinea-fowls, turkeys, pheasants, pigeons, ducks and geese, and none developed leukosis.

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[The Campaign against Tuberculosis in Cattle in Denmark according to the Law of June 26th, 1932. Petersen, G., and Christiansen, M. J. (1934.) *Deuts. tierärztl. Wschr.* *42*. 22.]

As a result of this law, the State takes a more prominent part in the attempt to eradicate tuberculosis from cattle and swine in Denmark. There are various schemes open to the animal owner. Under the first scheme the State provides 100,000 kroner (£4,550) annually to pay for the tuberculin testing of cattle on farms where the owner undertakes to separate non-reactors from reactors and untested cattle. All owners who perform such segregation within 14 days have the right to claim free tuberculin tests. Details as to what constitutes effective segregation are laid down. Obviously infected animals must be removed from the farm at the owner's expense and if dangerous animals are found among the reactors they may be slaughtered against compensation. Healthy animals must not be exposed to contact with poultry, because such contact may cause errors in the tuberculin reactions and cows infected from poultry may abort. Pigs, sheep and goats which have not passed the tuberculin test may not be allowed to come in contact with non-reacting cattle. Newly-purchased or otherwise newly-arrived cattle may not be placed among non-reactors unless accompanied by a veterinary certificate showing that they came from a tuberculosis-free herd or unless they successfully pass a tuberculin test twice at an interval of three months and are kept apart during this period.

The veterinary surgeon is obliged, under penalty of a fine, to see that segregation is carried out in a satisfactory manner and after each testing he must revisit the farm to ascertain that the isolation plan has been properly followed. It is also the veterinary attendant's business to inform the Veterinary Directorate if the owner fails to observe the regulations or admits unauthorised animals.

At the first testing of a small herd every animal must be tested, but in large herds only the younger animals need be tested, as it can be assumed in many cases that many of the older cows are infected. In each case, however, the non-reactors are to be isolated from the remainder.

In herds previously tested, the State will only undertake the expense of testing previous non-reactors and new untested young stock and not previous reactors—which, however, must be re-tested one year later. If this is not done the State many reclaim the cost of the first test. Reactors which are clinically recognisable as being probably affected with open tuberculosis, must be retested not 12, but 4 months later.

State Assistance for Herds of Non-reactors.—When a herd is found to contain no reactors at the first test, or when the campaign has progressed to such an extent that all reactors have been removed and the final herd has passed the intradermal test, the State assistance comes to an end except for the allowance that on such a herd being re-tested one year later, the State will bear half the veterinarian's fee and the costs of the tuberculin.

State Assistance for Optional Tuberculin Tests.—Cattle owners have the option of having their herds tested in order to find out the degree of infection therein. They are then not bound to pursue an active policy of eradication. In such cases the State agrees to pay half the

veterinarian's fees and the cost of the tuberculin—but this is subject to the condition that the herd has not been tested either privately or under State control during the previous five years. This is an alternative arrangement to the first scheme, the owner having the choice of going ahead as under the first scheme or not, as stated above. This alternative arrangement may be undertaken collectively by all members of a group of cattle-keepers in a small community and they may so interchange their animals after the results of the tests are known, as to form one or more groups of non-reactors from among the total cattle tested.

Free Tuberculin.—The State provides free tuberculin to certain cattle owners, but more particularly under this arrangement to dairy companies and similar societies who follow a definite plan of their own making, but approved by the Veterinary Directorate, for eradicating tuberculosis from their herds. They must also furnish an annual report of their progress to the Veterinary Directorate.

Directions for Tuberculin Testing. — The intradermal test must be used (1) when at total or partial expense of the State, (2) in the campaign for the building up of tuberculosis-free herds, (3) when employed in connection with public health measures, and (4) as a basis for actions at law. The subcutaneous test is only allowed in private tests and exceptionally in State tests where certain circumstances indicate. Subcutaneous tests in combination with ophthalmic tests may be used as check tests immediately after an intradermal test giving a doubtful result.

In this article details for carrying out only the intradermal test are given, but all test methods are defined in detail in the Danish law. For the intradermal test a site in front of or behind the shoulder may be used and the point of a reinforced needle is to be inserted into the deeper layers of the skin so that after injection an increase in its thickness is determinable. The thickness of the skin must be measured before and 72 hours after injection and only a type of caliper graduated in half millimetres and approved by the Veterinary Directorate may be used. The "reaction figure" is the difference in the measurements before and after injection. In judging the result of a test, not only is the reaction figure to be considered, but also the past history of the animal and the herd of which it is a part. The nature of the reaction swelling is also to be noted.

Individual animals not originating from a herd of non-reactors are to be considered as reactors if the reaction figure exceeds 2 mm. Animals in herds, which as a result of former testing and on all other grounds are considered as free from tuberculosis, giving a reaction figure not above 2·5 mm. may be classed as non-reactors. Animals reacting to a greater extent must, immediately after the test, be re-tested intradermally with bovine and avian tuberculin on the opposite side of the body. The reactions are observed 24 and 48 hours later and judgment is entered accordingly (avian or bovine type infection).

In all other herds a reaction figure of 3·5 mm. is to be regarded as positive and one between 1·5 and 3·5 as suspicious. Animals so reacting (suspiciously) must be placed among the reactors and re-tested by a double ophthalmic test (repeat in the same eye after one week) and by a double dose of bovine tuberculin subcutaneously applied simultaneously with the second conjunctival application. The temperature must be taken before injection and also at two-hour intervals between the sixth and fourteenth hours (both inclusive) or until a clear reaction is obtained. If only one of these re-tests gives a positive reaction, the animal is judged to be tuberculous. In the case of calves and young animals giving an initial doubtful reaction, the re-tests may be represented by the combined avian and bovine intradermal method. This, of course, only applies where there is a known possibility of cattle having been infected from poultry. [Most of our knowledge on avian type infection in cattle is based on the results of research carried out in Denmark by the State Serum Laboratory.]

Tuberculosis-free Herd.—A herd may be classed as free from tuberculosis only when all its members have successfully passed a tuberculin test at the most one month previously and when, in addition, (*a*) no reactor was found in the herd at a previous test carried out one-half to three years beforehand, or, if individual reactors were found at a previous test one-half year beforehand and were immediately removed, then the ranking as tuberculosis-free is not disturbed; (*b*) if in between the last two tuberculin tests no new animal was introduced except from another tuberculosis-free herd or unless it passed the test twice at an interval of three months after arrival and had been kept apart during the test period; (*c*) if after the last test no new animal had been introduced unless coming from a non-reacting herd.

The system of registration of animals passing from one herd to another is under strict regulations. The buyer of any animal gets most exact information on its past from its certificate, which also gives a sufficient description of the animal and the earmark.

Regulations for the tuberculin testing of pigs are also given. The approved test is the intradermal applied at the base of the ear (medial border), using avian and bovine tuberculin, one for each ear, and the reactions are read after 48 hours.

J. E.

[***Brucella abortus* in the Serous Effusion of the Hip-joint of a Cow.** Delez. (1934.) *J. Amer. Vet. Med. Ass. 38.* 3.]

By cultural and biological methods, the presence of a bovine strain of *Br. abortus* was demonstrated in the fluid from a swelling of the hip-joint of an eight-year-old Jersey cow, whose history was as follows: She had aborted three months and 17 months previously. Since last aborting, despite being served by several bulls, she failed to conceive. Swellings of the left knee, left hip and right stifle developed, with lameness in the left hind limb. Blood serum and hip-joint effusion agglutinated a suspension of *Br. abortus* completely up to a dilution of 1 : 1000. E. W. A.

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[**The Occurrence of Œstrum in Cattle during Pregnancy.** Bullard. (1934.) *J. Amer. Vet. Med. Ass. 38.* 3.]

According to Williams, 1 to 2 per cent. of pregnant cows show œstrum, usually not later than the fourth month, rarely as late as the eighth month of pregnancy.

This report concerns ten pregnant cows which showed œstrum during gestation. Of these, only one showed œstrum during two gestations. Five of the cases occurred during the first pregnancy, three during the third, and one each in the second, fourth and fifth pregnancies. Œstrum occurred at various times between the twelfth and the 253rd day.

E. W. A.

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[**Inhibitory Selective Culture Media.** Garrod, L. P. From St. Bartholomew's Hospital Reports. Vol. 66.]

In the space permitted for abstract it is only possible to deal with the major points contained in this booklet, which is very fully concerned with methods of selective bacterial cultivation. The purpose of bacterial cultivation is often to identify or to isolate in pure culture a single micro-organism, which is usually mixed with others in the material from which the original cultures are prepared. Unless that material be an inflammatory exudate uncontaminated from other sources, the numbers and variety of indifferent bacteria contained in it may be such that the isolation of the single significant type presents serious difficulties: these difficulties occur, for example, in the examination of water or soil, and of material from the alimentary or upper respiratory tract of man and animals. There are two methods, distinct in principle, for overcoming them: the primary culture may be made on a solid medium so constituted that the micro-organism which it is desired to isolate forms a characteristic colony, or primary cultivation may take place in a medium which is selective for this organism, furnishing either a pure culture directly, or one from which subsequent isolation by other methods is rendered easier.

The commoner substances incorporated in media for their selective action are grouped as follows:—

(1) *Metallic Salts.*—Sodium chloride used in a concentration of 6 to 15 per cent. in agar has been found to facilitate the isolation of Gram-positive cocci from excreta. Potassium tellurite has the same action and is used especially for the isolation of *C. diphtheriæ*, since its colonies present a characteristic appearance on media containing this substance.

(2) *Aniline Dyes.*—The selective actions concerned are among the most useful known, owing chiefly to the wide range of dilution in which they are effective. Following the work of Churchman (1912), who was struck by his success in eliminating *B. subtilis* from a contaminated urine with the aid of gentian violet, a general interest in dye action was stimulated. From the work of many investigators two main practical consequences have emerged: (1) that the violet dyes will eliminate Gram-positive bacteria entirely, or in extremely low dilutions differentiate between certain Gram-positive types; (2) that the highly toxic green dyes will also eliminate all Gram-positive bacteria and again in high dilution will differentiate between certain Gram-negative types. Use has been made of crystal violet for inhibiting Gram-positive sporing bacilli and, in certain low concentrations, for the recovery of the streptococci from skin disease and from milk; also in Petroff's medium for the isolation of the tubercle bacillus. Malachite green and brilliant green in suitable concentrations are employed for the isolation of *B. typhosus* from material also containing *B. coli*.

(3) *Bile and Bile Salts.*—The facts upon which this method of selective cultivation depend are that the growth of *B. typhosus*, *B. coli*, and allied organisms is not inhibited by bile and may even be encouraged by it, whereas the Gram-positive bacteria are inhibited. MacConkey's medium designed for this purpose consists of lactose agar to which is added 0·5 per cent. sodium taurocholate.

Penicillin, an extract formed from a mould, has an inhibitory action on Gram-positive bacteria and has been employed for the isolation of *H. influenzæ*.

The author, in conclusion, draws attention to the facts that no method of selective cultivation involving the use of the above substances is infallible and that success in their application is dependent on the control of factors such as the consistency and reaction of the medium in which they are used and also on the absolute strength of the specimens employed.

S. J. E.

Report

EDUCATION AND RESEARCH DIVISION, MINISTRY OF AGRICULTURE: REPORT FOR THE YEAR 1932-33

Part II.—Agricultural Education*†

This report relates to the first complete year (April, 1932, to March, 1933) during which the economy measures introduced in September, 1931, were operative. As explained in the previous year's report, these measures had hardly made themselves felt beyond their initial impact before the close of the financial year 1931-32; it is now possible to assess their financial result on a year's working and to draw some conclusion as to their effect in restricting or curtailing the different branches of work.

The principal measure taken by the Ministry in connection with agricultural education administered by local authorities was the reduction of grants-in-aid of maintenance expenditure (as from October 1st, 1931) to the uniform rate of 60 per cent. Authorities were informed that only in the most exceptional instances would it be possible to aid any fresh developments involving capital expenditure, and that if such aid were given the rated grant would be 60 per cent. As these measures were brought into operation on October 1st, 1931, and thus applied only to half the year 1931-32, in order to judge of their full effect over a complete year it is necessary to compare expenditure in 1932-33 against the expenditure in 1930-31.

In this latter year the expenditure of local authorities on the maintenance of agricultural education had been raised to a new level in consequence of developments and expansion of services to which they had been encouraged at the end of 1929, and it is reasonable to assume that but for the financial crisis of 1931 the expenditure of 1930-31 would have been maintained as normal in subsequent years. This expenditure was a total of approximately £369,000, on which the Ministry's grants were £247,500. In 1932-33 total expenditure by local authorities was reduced to £329,000, toward which the Ministry paid grants of £197,500. The economy measures therefore effected a saving by local authorities of £40,000, or 11 per cent. on the expenditure of 1930-31, and a saving in the Ministry's grant of £50,000, or 20 per cent. of the amount of grant paid in 1930-31. Practically all the authorities made cuts that were in some cases heavy, and in at least one instance went beyond what the Ministry thought necessary or even desirable; but as a general rule it may be concluded that the main structure of agricultural education administration has been left intact.

The financial crisis of 1931 compelled an all-round reduction, varying from 2 to 10 per cent., in the "block" maintenance grants to Agricultural Colleges (including University Departments of Agriculture) for the academic year commencing on October 1st, 1931; this reduction affected a saving of £2,800, or 5 per cent. on a total grant of £55,700. Moreover, certain colleges lost the increase of grant that might have been awarded to them on the recommendation of the Reassessment Committee that reported in July, 1931. Capital developments at agricultural colleges, except the very few for which commitments had already been made, were postponed. Nevertheless, the number of students enrolled in 1932-33, though slightly below the total for 1931-32, was substantially above any enrolment figure for the previous four or five years.

(A) HIGHER AGRICULTURAL EDUCATION AT UNIVERSITIES AND AGRICULTURAL COLLEGES

(i) *Maintenance Grants.*—As explained in the previous year's report, the annual "block" grants to University departments and agricultural colleges, which it was intended to assess on a five-year basis, were due for revision in 1930; but the recommendations of the Reassessment Committee were not received until the summer of 1931. The financial crisis necessarily rendered inoperative many of the Committee's proposals. The grants of 1930-31 remained as a basis; but reductions varying from 2 to 10 per cent. were made as from October 1st, 1931, and with only one exception these revised grants were paid again in 1932-33. The exception was Reading University; an increase at the rate of £1,000 a year was sanctioned for the establishment of a Chair of Horticulture at the University, but only half this sum became payable in the year 1932-33. Compared with 1930-31, therefore, the maintenance grants paid in 1932-33 show a reduction of £2,300.

Institution.	Grant in respect of academic year. 1930-31.	1931-32.	1932-33.
	£	£	£
Armstrong College, Newcastle-upon-Tyne	3,500	3,400	3,400
Cambridge University: School of Agriculture	6,500	5,850	5,850
Harper Adams Agricultural College	4,000	3,900	3,900
Liverpool University (School of Veterinary Science)	2,850	2,700	2,700
Midland Agricultural College...	3,000	2,850	2,850
Oxford University: School of Rural Economy	4,000	3,600	3,600

* *J. Min. Agric.* Vol. xli, No. 8, November, 1934.
† Part I of this Report, dealing with Agricultural Research (including Local Investigation and Advisory Work) appeared in the October issue of the *Journal*.

Institution.	Grant in respect of academic year. 1930-31.	1931-32.	1932-33.
Reading University: Faculty of Agriculture and Horticulture	4,000	4,800	5,300
Reading University: British Dairy Institute	900		
Royal Agricultural College, Cirencester	2,000	1,900	1,900
Royal Veterinary College ...	5,150	5,000	5,000
South-Eastern Agricultural College, Wye	4,000	3,700	3,700
Seale-Hayne Agricultural College	2,300	2,200	2,200
Studley College (for women) ...	1,000	950	950
Swanley Horticultural College (for women)...	1,750	1,700	1,700
University College of Wales, Aberystwyth...	7,000	6,800	6,800
University College of North Wales, Bangor			
Leeds University	3,800	3,600	3,600
	£55,750	£52,950	£53,450

(ii) *Capital Grants.*—The Ministry's commitments in respect of capital development, which in 1931-32 were £1,700, in 1932-33 were only £254. A sum of £104 was paid to Seale-Hayne Agricultural College as the final instalment of a grant towards the extension of the College dairy: the remaining £150 was a grant to Wye College in aid of interest charges incurred on a loan for the acquisition of the College farm. To these two items the Ministry was committed before the financial emergency placed a bar on further developments; apart from these small sums no other capital grants were made.

(iii) *Students.* — The following statement shows the numbers of students in attendance at institutions for higher agricultural (including veterinary) education during the past five years:—

1928-29	1,957
1929-30	1,896
1930-31	1,948
1931-32	2,064
1932-33	1,994

Although the continuing depression in the industry and the financial crisis had their effect on the entries at certain of the institutions, it is surprising that on the whole the numbers were so well maintained. The number of veterinary students which in 1931-32 had shown a marked increase, was still further augmented in 1932-33.

(B) AGRICULTURAL EDUCATION PROVIDED BY LOCAL AUTHORITIES

(i) *Maintenance Expenditure.*—The following table shows the expenditure incurred by county authorities during the past seven years in maintaining their schemes of agricultural education, together with the amounts of grant-in-aid paid by the Ministry:—

Year.	Expenditure.			Grants.		
	England.	Wales.	Total.	England.	Wales.	Total.
	£	£	£	£	£	£
1926–27	272,777	47,246	320,023	182,015	32,590	214,605
1927–28	265,705	45,664	311,369	177,989	31,529	209,518
1928–29	255,948	41,513	297,461	171,569	28,767	200,336
1929–30	261,838	40,614	302,452	175,480	28,175	203,655
1930–31	319,275	49,570	368,845	213,842	33,664	247,506
1931–32	309,730	50,603	360,333	194,807	32,563	227,370
1932–33	281,322	47,884	329,206	168,793	28,731	197,524

It should be mentioned that the increased expenditure in 1930-31 was due to extensions and improvements of their existing schemes, decided upon by the counties in response to the Department's circular letter of November, 1929. The decline both in expenditure and grants-in-aid observed in 1931-32 is accounted for by the economy "cuts" that began to operate towards the end of the year, and by the reductions in the rates of grant from October 1st, 1931; the further decline in 1932-33 shows the effect of these measures over a full year of operation.

(ii) *Capital Expenditure.*—A sum of £7,290 was paid during the year in question to three county authorities in England and Wales, in aid of capital expenditure on the provision and equipment of farm institute buildings, alterations and adaptations, and the provision of a water supply.

The authorities were contractually committed to these schemes before the financial crisis put a stop to capital developments.

During the year the West Sussex Authority negotiated the sale of a portion of the Kingsham Farm. Out of the proceeds the Ministry approved expenditure to erect certain farm buildings for the purpose of establishing a tubercle-free herd of cattle.

(iii) *Courses of Instruction.* — Of 22,667 students who received some form of instruction in 1932-33, about one-third were women, who were mainly taking courses in dairying, poultry-keeping and rural domestic economy.

The year 1932-33 showed a satisfactory increase in the number of students who received organised instruction in agricultural subjects; and with the exception of organised day courses, the numbers of courses also showed an all-round increase.

It is also satisfactory to note the rising number of students attending Farm Institute courses. Most of these Institutes have been quite full, and in some instances recourse has been made to outside residential accommodation where conveniently available.

(iv) *Scholarships.*—During the year under review 1,353 agricultural scholarships were awarded by local authorities, the total cost involved being £22,550. The corresponding figures

for the previous year were 1,659 scholarships and £24,696.

(v) *Staff and their Advisory Work.*—Of the 62 Administrative Counties in England and Wales, four (Hunts, Isle of Ely, Isles of Scilly and Soke of Peterborough) do not employ Agricultural Organisers. In the remaining 58 counties, 54 Organisers are employed. The Professor of Agriculture at Leeds University acts as Organiser for the three Ridings of Yorkshire; and a joint arrangement of one Organiser serving two counties exists for Cumberland and Westmorland, and for Brecon and Radnor. The Organiser is generally assisted by a staff of experts in subjects allied to agriculture. The total number of full-time instructors is 358. In addition a number of part-time instructors in the various subjects is also employed.

In addition to the organised instruction given to students and the management of county farm institutes, experimental stations, demonstration plots and egg-laying trials, the county staffs serve the industry in an advisory capacity.

The interest taken by farmers in the new agricultural and marketing developments has caused a great deal of work. It has meant generally that county staffs have worked under heavy pressure. In a few instances it has been found possible to make small improvements in staffing arrangements at the expense of other activities; but it is becoming clear that further increases in staff will be required in the near future, if an adequate advisory service is to be maintained.

(C) DAIRYING

The work of the Department in this subject includes (1) the supervision of the facilities provided at agricultural colleges and by local authorities at farm institutes for courses of instruction in dairying, the appointment of dairy instructors for educational work in the counties, and (2) the formulation and administration of schemes that aim at improving farmers' technique and at the provision of a clean milk supply. Under this last head come the clean milk competitions, the county registers of accredited producers, and advisory schemes that are organised on similar lines. During 1932-33 the financial restrictions to which reference was made in the previous report continued to operate: if they can be relaxed shortly, considerable advances may be made at an early date. The desire for technical instruction has probably never been greater among farmers.

Courses of Instruction. — The number of students who were taking regular courses in dairying at agricultural colleges and farm institutes during 1932-33 was 1,058, *i.e.*, 230 at agricultural colleges and 828 at farm institutes. These figures show a slight increase on the previous year's total of 1,043 students: but there was unfortunately a decrease in the numbers of students attending occasional courses in dairying, butter- and cheese-making, etc., which in 1932-33 were slightly above 3,400 as compared with about 4,000 last year.

The courses at agricultural colleges may be full-time courses proceeding to a degree or diploma in dairy husbandry as at Reading, or they may form part of the general agricultural course. The arrangements at farm institutes provide for short courses of six months, especially for women students, the men students generally taking dairy husbandry in their agricultural course. The instruction given at farm institutes is of a more elementary and practical type than that at agricultural colleges; it is designed to turn out men and women capable of taking the more responsible posts among farm workers. The occasional courses are generally arranged for short periods of a few weeks, for the instruction of local groups in the technique of butter- and cheese-making or of farm workers in hygienic methods of milking. In a number of instances travelling schools are organised, particularly for cheese-making and in certain districts for butter-making: during the year 233 such schools were held and were attended by 2,424 students. Approximately 43,000 persons attended decentralised lectures and demonstrations, an increased attendance of 6,000 over the previous year.

Clean Milk Production.—The Ministry has made efforts for some twelve seasons to stimulate the production of clean milk through the organisation of clean milk competitions in the counties, and as experience has been gained other forms of activity directed to the same end have been developed more recently. First introduced in Essex in 1920, the clean milk competition scheme has been generally taken up by local authorities throughout the country, and in all the important dairy districts such competitions now form a regular feature of the county educational schemes. Uniformity has been secured through the Ministry's "Guide to the Conduct of Clean Milk Competitions," first issued in 1924, in which a definite plan is laid down for farm inspections and the taking of samples for bacteriological examination. The Ministry aids expenditure on these schemes at the rate of 60 per cent. In 1932-33, 28 clean milk competitions were commenced in England and Wales.

During the past twelve years approximately 5,200 dairy farmers have taken part in these competitions. Although this figure represents only about one in 30 of the dairy farmers of the country, it must be remembered that the beneficial influence of clean milk competitions extends far beyond the competitors. A general knowledge of the methods employed and the standards to be aimed at spreads throughout the country and has an indirect, but appreciable,

influence in improving the quality of milk production.

Milkers' Competitions.—These have, for many years, been organised in dairying districts, and at one time had only a competitive interest. They have now been brought into direct relation with the clean milk movement by being made the vehicles for providing instruction for agricultural workers in the technique of hygienic methods. Milkers' competitions, therefore, are not recognised by the Ministry unless they have a definite educational aspect. In 1932-33, 59 milkers' competitions were organised in 24 counties. In the twelve years since 1920 more than 10,000 employees have been entered in these competitions; there is, moreover, reason to think that they have a beneficial influence on the work of many dairy workers who have never themselves participated in a competition.

County Registers of Accredited Producers.—For dairy farmers who have been through a clean milk competition and who require some organised means to enable them to maintain their standard of production, county registers of accredited producers have been instituted. The scheme was first introduced in Wiltshire in 1929, and in 1932-33 it was in operation in nine counties. Briefly, the scheme provides for the registration of producers who have obtained 66⅔ per cent. of the marks available in a county clean milk competition of six months' duration (or in a "probationary" inquiry conducted on similar lines). Samples of milk from all accredited producers on the register are examined each month, and each sample is expected to conform with the following standard:—

Bacterial Count not exceeding 300,000 per c.c.
Bacillus coli absent in 1/100 c.c.

A producer who fails to conform with the standard in three consecutive months is suspended from the register until such time as he submits three consecutive satisfactory samples. The latest complete figures in respect of this scheme are for the year ended December 31st, 1932; they may be summarised as follows:—

Number of county educational authorities concerned	9
Total number of registered producers ...	183
Total number of samples examined ...	1,958
Total number of samples that conformed with the standard laid down in the scheme	1,431

As mentioned in previous reports, certain distributive firms have made use of the clean milk competition or the register of accredited producers in connection with the payment of a bonus for milk of high standard. This project, however, will presumably soon be merged in the scheme for a Register of Accredited Producers, contemplated by the Milk Marketing Board.

Advisory Schemes.—An advisory service that includes the bacteriological examination of milk samples is available in eleven counties for licensed producers of designated milks and others, *e.g.*, farmers who have qualified for a certificate in a clean milk competition and who are ineligible to participate again in a competition, in order that such producers may be able to maintain their standard of efficiency.

Courses for Dairymen.—Sixteen courses were held during the year, a lower number than might have been expected but for the financial restrictions on educational work. The experience of the last few years in this matter leads to the conclusion that where they are carefully organised these courses are appreciated, and they are certainly a valuable means of educating dairymen in the proper handling of milk in distribution. As opportunity offers it is hoped to extend courses of this nature.

(D) POULTRY AND SMALL LIVESTOCK

The work of the Department in this subject includes a general supervision of the facilities provided by local authorities for instruction in poultry subjects at farm institutes and by means of an advisory service; it is concerned also with the framing and administration of practical schemes, *e.g.*, the county egg-laying trials, the accredited poultry-breeding stations scheme, and the cockerel-breeding schemes; and the general administration of the National Poultry Institute scheme. As regards other small livestock, attention is given mainly to the keeping of goats and rabbits.

Instructional and Advisory Services.—Courses of instruction in poultry husbandry at Agricultural Colleges may be of one or two years' duration, and lead generally to the standard required for the National Diploma in Poultry Husbandry. In farm institutes shorter courses are given, but many of them provide a year's course. To meet the needs of students who cannot comply with the regulations for the National Diploma in Poultry Husbandry (which require a year's experience on an approved poultry farm) a new qualification—the national certificate in poultry practice—was instituted in 1932 by the National Poultry Diploma Examination Board; it can be obtained by examination after a year's course, both theoretical and practical, at an approved institution.

Courses in poultry husbandry are very popular both with men and women students. The number of students taking the advanced courses at the National Institute of Poultry Husbandry in 1932-33 was 36, which, though not quite so high as in the peak year 1930-31, is satisfactory. Taking the agricultural colleges together the poultry students numbered 130, while in farm institutes 400 poultry students were enrolled during the year, making a total of 530. How great an advance has been made may be realised by comparing these figures with those of 1912-13, when a total of 68 poultry

students was recorded for the country as a whole, *i.e.*, 46 in agricultural colleges and 22 in farm institutes.

For the assistance of the practising poultry farmer, local authorities have instituted an advisory service through the appointment of County Poultry Instructors who are available to give advice to all poultry keepers in their area on points of practical difficulty. During the winter months local lectures on poultry subjects are arranged in nearly all counties. In order to keep County Poultry Instructors in touch with the results of recent poultry research, two refresher courses were arranged during the year, at the Ministry's Veterinary Laboratory, Weybridge. These courses were highly successful, and occasion will be taken to arrange others to accommodate Instructors who were not able to attend the previous courses.

County Egg-laying Trials.—In 1932-33 trials were conducted by 39 counties under the Ministry's scheme, as against 38 in 1931-32. The number of birds competing was 9,105 in 1932-33, as against 8,409 in the previous season. For the year under review, the regulations as to the scoring points were subject to revision with the object of giving due credit to birds that lay most heavily in the winter months. The average egg production during this season's trials was 181·87 per bird, which compares satisfactorily with the average of 181·23 in 1931-32. The leading county in this season's trials was Lindsey (Lincolnshire), and to this county goes for the second time the Competition Cup presented by the Millers' Mutual Association.

The death-rate among high-grade stock has been giving rise to anxiety among poultry breeders for some years past, and the incidence of mortality at county laying trials leaves no doubt of its seriousness and growing importance. During the last six years there has been a steady rise in the percentage of mortality recorded, from 5 per cent. on 2,800 birds in 1927-28 to 10·7 per cent. in 1932-33 when over 9,100 birds were entered in the trials. Heavy as this death roll is, it is understood to be well below that recorded for the total number of egg-laying trials recognised by the National Poultry Council.

Accredited Poultry-breeding Stations.—During the season 1932-33 the Accredited Poultry-breeding Station Scheme was operating in 17 counties, and the station holders numbered 121. This represents a substantial growth over the previous season, and the evidence is quite favourable to a further expansion. For the purpose of securing uniformity, the Ministry has issued model regulations governing the classes of stock that are to be allowed under the scheme, and the conditions as to testing birds for freedom from bacillary white diarrhœa. A national register has been compiled, which it is proposed to re-issue annually, containing particulars relating to all the station holders throughout the country.

Cockerel-breeding Scheme.—This scheme aims at making available at reasonable prices cockerels bred from first-class hens that have been awarded the special merit certificate at county laying trials. It was begun in a tentative way by a single county in 1928-29 and is now in operation by seven counties. The scheme is still in an experimental stage, and the Ministry has not yet found it desirable to issue model regulations, though, for the most part, the schemes in operation are practically identical. Particulars received to date relating to the 1932-33 season are not quite so favourable as for the previous season in respect of the numbers, and sometimes of the quality, of the cockerels reared; but it is not expected that the special difficulties that were encountered during this season will recur.

National Poultry Institute Scheme.—It is unnecessary to refer in detail to the experimental and research work that is being carried out under the National Poultry Institute Scheme. The following brief notes will suffice to indicate the nature of the work in progress; for further particulars reference should be made to the annual report issued by the Ministry on the work of the Research Institutes.

(a) *National Institute of Poultry Husbandry.*—During 1932-33 an attempt was made to simplify the experimental work and to concentrate it on a few important issues. The main work consisted in the trial of rations to test the value of different constitutents, and of various classes of stock under different systems of management.

(b) *Ministry's Veterinary Laboratory, Weybridge.*—The work on tuberculosis in poultry has been continued and extended. Outbreaks of disease among pheasants and ducklings have claimed attention during the year. In addition, the investigation of other diseases, including Newcastle disease, fowl paralysis, and coccidiosis, has been continued.

(c) *School of Agriculture, Cambridge.*—Work has been continued on the effect on the quality of both eggs and carcase produced by feeding fatty materials, etc.

(d) *Breeding Work on Poultry at Cambridge.*—The study of the inheritance of fecundity has been continued; a new breed, the Silver Cambar, has been fixed, as well as a new breed of dark runner ducks that give a sex-linked result with fawns. The nature of the blue egg has been investigated, and its relation to white and brown eggs studied. Progress has been made with the improvement of the Cambar from a commercial standpoint.

(e) *Northern Breeding Station, Reaseheath.*—As the experiments in in-breeding in which a father-daughter mating was used have been concluded, a new series of experiments has been drawn up, including (*a*) a cross-breeding experiment to study the value of the first cross against the pure breed, (*b*) an attempt to produce a strain of commercial poultry capable of withstanding continuous in-breeding, and (*c*) a study of the inheritance of fertility in White Wyandottes.

(f) *Southern Table Poultry Experiments at Wye.*—The investigation in 1932-33 was mainly concerned with the possibility of reducing feeding costs during the fattening period without impairing the quality or weight standard of the table birds produced.

Stud Goat Scheme.—The scheme, the local administration of which is in the hands of the British Goat Society, aims at encouraging the keeping of goats of improved milking quality by small breeders, etc. Services by approved stud goats are available at a charge of not more than 4s. a service, and a number of premiums are awarded to qualified goats. During 1932-33 goats were stationed at 97 centres approved under the scheme. The Ministry makes a grant towards administrative expenses and the cost of the premiums awarded.

Rabbits.—From the Ministry's information it appears that rabbit-keeping as a side line is still fairly popular: but that the economic depression has hit the industry badly. There is still a limited market for good quality Angora wool at fairly satisfactory prices; and the same may be said of first-class pelts.

(E) MISCELLANEOUS

(1) *Scholarships for the Sons and Daughters of Agricultural Workmen and Others.*—The scheme under which these scholarships are awarded was established in 1922 and owes its inception to the Corn Production Acts (Repeal) Act, 1921. Its main objects are (*a*) to fill a gap in the existing agricultural education system by opening to children of agricultural workers an avenue whereby they can obtain a sound technical training in agriculture, and (*b*) to improve the standard of agricultural production by returning annually to the industry a body of young men and women well trained and skilled in the practices of agriculture.

Benefits under the scheme are confined to (*a*) sons or daughters of agricultural workmen, or of working bailiffs and smallholders whose means are comparable with those of agricultural workmen; (*b*) sons or daughters of other rural workers whose means and method of livelihood are comparable with those of agricultural workmen; and (*c*) *bonâ fide* workers in agriculture.

Awards are of three types, namely, (1) junior scholarships tenable at farm institutes and similar institutions for courses, not exceeding one year, in agriculture, horticulture, dairying or poultry husbandry, or in a combination of two of these subjects; (2) extended junior scholarships for advanced or specialised courses of instruction, not exceeding one year, at farm institutes or agricultural colleges (these awards are reserved for those who have already held junior scholarships); and (3) senior scholarships tenable for degree or diploma courses in an agricultural subject at university departments of agriculture or agricultural colleges, or for courses in veterinary science at veterinary colleges. All awards cover the whole cost of instruction while students are at the training institutions, and in addition provide for the payment of allowances on a scale sufficient to meet ordinary living expenses adequately, but economically, at the institutions concerned.

During the twelve years the scheme has been in operation (1922-33) assistance has been granted to some 1,300 individuals, involving the award of 1,494 scholarships. Of these, 70 were for degree courses extending over three or four years, 94 for two-year diploma courses and 1,330 for farm institute courses. The distribution of the awards among the various classes of beneficiary is as follows:—

	Eleven years. 1922-32.	1933.	Total
Sons or daughters of—			
Agricultural workmen	357	40	397
Working farm bailiffs	106	10	116
Smallholders	338	36	374
Other rural workers	215	21	236
Candidates who qualified on their own account as *bona fide* workers in agriculture	343	28	371
	1,359	135	1,494

Reviews

[The Organisation and Improvement of Stock Farms in the Belgian Congo. (Trans. title.) Leplae, Edn., and Tobback, L. pp. 499. Size 6¼-in. by 9½-in. Price 35 fr.]

This book is worth studying by all those associated with the development of the live stock industry in tropical countries.

The first part of the book, written by E. Leplae, deals with the establishment and management of cattle ranches in the Belgian Congo. These ranches were established to supply the demand for meat which arose with the industrial development of the country and the concentration of labour in centres for gold mining and other activities. Sixty thousand head of cattle now exist in areas in which cattle were previously scanty or absent—a condition which, in Africa, may be considered to indicate an unsuitability to bovine life due to tsetse infestation or some similar disability.

That the rate of increase of these herds compares favourably with stock in Rhodesia, and that a considerable number of European stock have been established, indicates how completely the natural difficulties have been overcome. This successful achievement gives the writer an authority which few can dispute; the theories on which it was based deserve careful consideration, and with further research may lead to

improvements in the pastoral conditions of the tropics which may become of world importance.

The notes on the improvement of pastures and on the cultivation of additional crops as a ration for the dry season are particularly interesting. These chapters might have been more instructive had more details been included as to the actual yields of natural and improved pastures and the food values of the various crops cultivated, but it must be remembered that a large part of the work must have been carried out under very primitive conditions without the facilities for scientific observation and detailed analyses.

The chapter on the various races of cattle employed, and suggestions as to the blending of these races is interesting, but we would have welcomed more detailed information as to the value of native African breeds. It is considered that an admixture of European blood of over one quarter is inadvisable as a higher proportion may lead to loss of thriftiness and inability to withstand local diseases. It would seem that a very careful study of native breeds should be undertaken if they are to form three-quarters of the basic blood of an improved herd.

The descriptions of the native cattle credit some breeds with good conformation, but all are accused of poor powers of milk production and slow development. Recent work in Kenya and Uganda has tended to show that the native cow is not so inferior as was at first supposed. We wonder if the inferiority has not been largely accentuated by comparing the scrub-fed, tick-infested native animal, stunted by the various forms of piroplasmoses through which it has had to fight its youth, with the guarded, groomed and dipped imported animal, fed to the last ounce of its ration for maintenance and milk production.

The native African owner is thought to prefer quantity to quality and to have little appreciation of the laws of heredity. This habit is no doubt due to the indigenous custom of reckoning the wealth of an individual in terms of the number of cattle, and is it not possible that this insistence on quantity is due to the awful losses from disease which his people have suffered in the past? There are indications that the instinct of insurance by quantity is disappearing in the face of veterinary assistance and effective disease control.

The fact that the native owner recognises the influence of heredity is no doubt obscured by superstitions, founded on past experience, which the European observer cannot appreciate, but most will admit that it is rare for either a good cow or a good bull to be offered for sale. Some African tribes punish the killing of a man by a cow not only with the slaughter of the animal but also with the slaughter of its descendants and parents. It seems that they must ever recognise that there are recessive factors in heredity. One is tempted to think that if the complete co-operation of native owners could be obtained, it would be possible to start selective breeding with bulls of known pedigree and thus shorten the most disheartening period of the work.

The second part of the book, written by M. Tobback, is devoted to tropical diseases of stock and their diagnosis and treatment. It includes chapters on diseases due to bacteria, viruses and animal parasites, nutritional diseases, toxicology and the special African problems of ticks and tsetse fly. There are also notes on the organisation of the veterinary services, the laws dealing with the control of contagious diseases, and the collection and preservation of specimens for transmission to the laboratories for purposes of diagnosis. This section is written primarily for the information of stock owners, and, from this aspect, the information given appears to be too detailed and somewhat lacking in definite directions as to what action should be taken. On the other hand, for the veterinary reader, it gives a useful outline of the main problems of tropical stock diseases. It appears to have been very carefully compiled, and is remarkably free from inaccuracies, considering the wideness of the subjects covered. It has also the merit of having been brought up-to-date, and though some of the treatments suggested must still be considered as in the experimental stage, yet, as references are given to recent literature, the reader is able to consult the original papers and draw his own conclusions. For the British reader the nomenclature adopted for trypanosomes and piroplasms might present some difficulties, but the names can easily be adjusted by reference to a text book.

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"RUBBER AND AGRICULTURE"

In connection with the recent issue, by the Rubber Growers' Association, of a booklet entitled "Rubber and Agriculture," it is interesting to recall that the founder of one of the contributory firms was a well-known veterinary surgeon (Mr. Dunlop).

The booklet, as its name suggests, brings to notice many uses to which rubber has been and is being put and suggests to one's mind many further possible uses—for instance, rubber flooring for canine hospitals, rubber rims on the bottom of all pails and similar containers (as are actually now fitted to milk churn bottoms), Sorbo rubber collar linings for horses, etc.

Section 2, which treats of pneumatic-tyred farm vehicles and especially that part dealing with the actual dynamometer readings regarding the difference in both the initial pull and what may be described as the "maintenance pull" between iron-tyred and pneumatic-tyred vehicles, is alone sufficient to convince even the most sceptical that this modern mode of farm transport must of necessity be more efficient and more economical in every respect, than the former type, which must now be regarded as obsolete.

Rubber flooring for travelling horse boxes and also for stable flooring, given a surface ridged

(*Continued at foot of col.* 1, *page* 1487.)

VICTORIA VETERINARY BENEVOLENT FUND

Ladies' Guild

At a meeting of the above Guild held at 10, Red Lion Square, W.C., on Wednesday, November 28th, 1934, it was decided by the members present to send to Dr. Bullock, Secretary of the Victoria Veterinary Benevolent Fund, a cheque for £150, the money to be used for the relief of necessitous widows or female relatives of members of the R.C.V.S.

It may interest readers to know that £86 12s. of this amount was raised in Edinburgh at a dance, etc., held there during Congress week.

The Guild are hoping to arrange a dance in London in aid of the Fund, to be held at Princes Galleries on Thursday, January 17th, 1935. Further particulars will be announced when arrangements are complete.

Minnie S. Nickinson,
Hon. Secretary and Treasurer.

In Parliament

The following questions and answers have been recorded in the House of Commons recently:—

Foot-and-Mouth Disease

Mr. Lambert asked the Minister of Agriculture whether the source of infection resulting in an outbreak of foot-and-mouth disease in Devon has been ascertained; and whether the progress of the disease has been arrested?

Mr. Elliot: An outbreak of foot-and-mouth disease on premises at Chudleigh was confirmed on November 20th and the existence of the disease on premises adjoining was confirmed on November 24th. The source of infection in the original outbreak has not been ascertained, but certain factors involved are still being investigated. As regards the last part of the question, I am afraid it is not possible at this stage to express any view as to the further spread of the disease.

Mr. Lambert: Has the right hon. Gentleman's attention been called to the dictum of the Agricultural Research Council that this disease may come into the country through infected carcases?

Mr. Elliot: Oh, yes. There is no doubt of that possibility.

Mr. Lambert: Are the Government taking steps to see that infected carcases shall not come into the country?

Mr. Elliot: The attention of importers has been drawn to the dangers that infection coming to this country may cause to stock breeders and farmers. In any case, there are very large imports of meat coming into this country, and it would be quite impossible to stop them all.

Mr. Lambert: Will the right hon. Gentleman take steps not merely to ask importers, but to stop infection by excluding diseased carcases from this country?

Mr. Elliot: I should be very glad to do so if there were any practicable way of doing it without causing an enormous amount of injury to widespread interests in this country, including those of the consumers of meat.

Mr. Charles Williams: Does the Minister consider that adequate means are at his disposal for stopping the risk of importing diseased carcases, or would he like wider powers?

Mr. Elliot: I am sorry that we have not adequate means, and I cannot at the moment recommend any further means with which I should like the House to endow me. If I can think of any, I shall certainly bring the matter forward.

Lord Apsley asked the Minister of Agriculture whether the initial source of infection which caused the recent outbreaks of foot-and-mouth disease in the Thornbury district of Gloucestershire has yet been located by the inspectors and experts of his Department?

The Minister of Agriculture and Fisheries (Mr. Elliot): The series of five outbreaks of foot-and-mouth disease in the Thornbury area, the first of which was confirmed on October 27th, was at first thought to be a recurrence of the previous outbreaks in this area declared on September 14th. Examination of the viruses responsible for each of the two series of outbreaks indicates, however, that they differ in type, the conclusion being therefore that the second group of outbreaks is not associated with the first. No evidence of a suggestive character has been found which would point to a source of infection in the second group of outbreaks.

Lord Apsley: Can my right hon. Friend say what was the initial cause of the first outbreak, if they have not found out the cause of the second?

Mr. Elliot: Our investigation has not shown any indication of the manner in which infection might have been introduced in the first outbreak.

Lord Apsley asked the Minister of Agriculture whether he can from the experience gained by his Department state the initial causes of infection of all or any foot-and-mouth disease epidemics in the United Kingdom during the last five years?

Mr. Elliot: From January 1st, 1930, to November 3rd, 1934, 57 outbreaks of foot-and-mouth disease deemed to be new have occurred in Great Britain. Of these, one (in 1931) was due to importation of animals from Northern Ireland, but in the remaining cases no proof was obtained as to the source of infection. In 34 cases, there was association, direct or indirect, with the disposal of household refuse of all kinds including probably a normal proportion of materials imported from abroad. In two other cases, packing materials were present on or near the premises, but in the remaining 20 outbreaks, no evidence of a suggestive character was discovered.

Sir Francis Fremantle: Can the right hon. Gentleman say whether he has any evidence as regards the suggested carrying of this disease by starlings?

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or grooved to prevent slipping, and providing a suitable adhesive affording a permanent waterproof joint can be ensured, appears to be a step in the right direction, and would probably eliminate the necessity for bedding. Rubber brushes for grooming and other purposes are clean, efficient, and easily sterilised, while the use of rubber clothes, gloves, boots, horse shoes, and pads is too well known to call for comment.

The booklet, which is well illustrated, is available free of charge, and interested readers can obtain a copy upon application to The Secretary, The Rubber Growers' Association, 2-4, Idol Lane, Eastcheap, E.C.3.

Mr. Elliot: Obviously, the contamination of small animals might succeed in disseminating the disease either by birds or foxes or other animals, but I do not think that we have any special knowledge as to dissemination by starlings in particular.

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Sheep-farming Industry

Mr. Henderson Stewart asked the Secretary of State for Scotland whether he has considered representations from the Blackface Sheep-breeders' Association with reference to the serious position of sheep lands owing to lack of drainage, the spread of bracken, and the destruction wrought by the maggot fly; whether he is aware that these factors inflict great losses upon the sheep-farming industry; and whether he proposes to offer any assistance to mitigate the evil?

Sir G. Collins: The representations referred to in the first part of the question are under consideration. The answer to the second part is in the affirmative. As regards the last part, the amount of the drainage grants for the improvement of hill pastures during 1935 is receiving active attention. With regard to bracken, I am endeavouring to obtain an interim report on the results of the experiments recently conducted. With regard to the sheep-maggot fly, a scientific investigation into the methods of treatment and control is being conducted, and particulars of the results obtained to date were published in the Scottish Journal of Agriculture in July.

Mr. Stewart: In view of the very great importance of this industry to Scotland, will the right hon. Gentleman consider expediting these various inquiries and assisting the trade, especially in view of the fact that the death-rate of sheep and lambs in some parts of Scotland reaches a figure as high as 10 per cent.

Sir G. Collins: I realise the serious nature of these matters, and have asked for a report as soon as possible.

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British Army (Cavalry, Cost)

Mr. Lambert asked the Financial Secretary to the War Office what was the cost to the Exchequer of the Cavalry and the Household Cavalry for the year 1933-34?

Mr. Hacking: The effective cost of the Household Cavalry and the horsed regiments of the Cavalry of the Line on the British establishment is estimated at £1,130,000 a year.

The American Shropshire Registry Association, the largest association of its kind in the world, celebrates its golden anniversary this year, having been organised in 1884. Striking proof of the popularity of Shropshire sheep in the United States is evidenced by the fact that during the past fiscal year the business of the association in question had improved almost 25 per cent. over the previous year, and was about 40 per cent. better than that of 1932. The golden anniversary was celebrated at Chicago during the National Live Stock Exposition held the first week of December.

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In experiments carried out at the Hannah Dairy Research Institute in an endeavour to find a suitable floor for a dairy byre, one that has proved satisfactory is of concrete with tubular spaces incorporated. It is said to be drier and 10 degrees warmer than solid concrete, in addition to being more kindly to the feet.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Dec. 11th.—Meeting of the Society of Veterinary Practitioners, at Derby.

Dec. 13th.—Meeting of the Dumfries and Galloway Division, N.V.M.A., at Dumfries.

Dec. 14th.—Meeting of the South Wales Division, N.V.M.A., at Llandilo.

Dec. 17th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4 p.m.

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R.C.V.S. OBITUARY

Fenwick, David Charles, Veterinary Inspector to Glamorgan Agricultural Committee; "Highmead," Cadoxton, Neath. Graduated London, July 10th, 1925; died November 23rd, 1934, aged 46 years.

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PERSONAL

The members of the New Zealand Veterinary Association (Inc.) at a meeting held in Wellington recently, at which Sir Arnold Theiler was a guest, passed a resolution that Sir Arnold be made an Honorary Life Member of their Association.

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The King has granted Major Charles Rowland Chadwick, M.R.C.V.S., late Inspector-General of Veterinary Services, Iraq, Royal licence and authority to wear the Insignia of the Fourth Class of the Order of Al Rafidain, conferred by the King of Iraq.

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Engagement.—Dr. W. S. Gordon—Miss L. M. Porter. The engagement is announced of Miss Leone M. Porter, only daughter of Mr. and Mrs. J. Finlay Porter, 17, Danube Street, Edinburgh, and Dr. W. S. Gordon, M.R.C.V.S., son of Mr. and Mrs. Robert Gordon, 2, Northfield, Liberton, Edinburgh. The wedding will take place this month.

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On Leave.—The following Colonial Service Veterinary Officers arrived home on leave from the Colonies, Protectorates, etc., during the month of November: Mr. E. F. Peck (Nigeria), Captain R. A. B. Stanhope (Federated Malay States), Messrs. R. C. U. Fisher and H. G. Stewart (Uganda).

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A correspondent writes: "The personal note, relative to appointments in the University of Manchester, published in your last issue, should read: 'Mr. H. Burrow, M.R.C.V.S., D.V.S.M., has been appointed Lecturer (part time) in Veterinary Hygiene, and Mr. J. Holroyd, F.R.C.V.S., D.V.S.M. (Vict.), Lecturer (part time) in Veterinary Law and Administration."

ARMY VETERINARY SERVICE

Brevet Lieut.-Colonel J. J. M. Soutar, O.B.E., R.A.V.C., is appointed officiating Director of Veterinary Services, India.

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"A CLASSICAL CASE OF WEIL'S DISEASE"

The above description was given by Dr. William Barnard, consulting histologist to the London County Council, of the result of a *post-mortem* examination made by him on the body of a tunnel miner employed by the Hammersmith Borough Council. There were cases in Holland and Germany before the War, and since then cases had been reported in England, said Dr. Barnard. The organism was parasitic to the rat—it was in the rat's kidney, and the disease had been contracted in the canals in Holland by people when bathing. There was one proven case where a bargee contracted it in the Thames.

The Coroner (Mr. Ingleby Oddie).—This adds a new terror to life. What can be done to protect men in sewers?

Dr. Barnard.—The most important thing is to make a general investigation of the disease itself. Dr. Barnard added that it was believed that, apart from cuts, the germs could enter the nostrils and mouth through touching sewer slime when rats had been through it, and through unbroken skin.

The Coroner, recording a verdict of death by misadventure, said he was satisfied that the man died from the effects of this particular kind of jaundice, contracted while at work.

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CENTRAL PROVINCES, INDIA: ADMINISTRATION OF CIVIL VETERINARY DEPARTMENT

A Government resolution on the report on the working of the Civil Veterinary Department for the year ending March 31st, 1934, says:—

"The year 1933-34 was again not a very healthy one for the cattle of the province. The total number of outbreaks recorded was 13,848 (12,845), although the total casualties were 37,804 (39,174), a little less than those of the previous year. The outbreak of foot-and-mouth disease was one of the worst in recent years; anthrax prevailed in most of the districts; hæmorrhagic septicæmia assumed a severe form in five districts and blackquarter occurred considerably in three districts. The incidence of rinderpest, which still continues to exact the heaviest toll of the cattle of the province was, however, distinctly less severe, the deaths and outbreaks being 25,449 (31,807) and 3,674 (4,469), respectively. It will be interesting to investigate if, apart from its cyclic character, this result can be attributed to any extent to the preventive inoculations undertaken by the Department on an increasing scale. Piroplasmosis which is endemic in the province is now less prevalent owing to the increasing use of trypan blue.

"All outbreaks of contagious diseases were reported and attended to with improved promptitude. The number of inoculations rose to 448,993 (399,991) and that of castrations to 127,475 (105,769). Including castrations the number of cases treated on tour and at dispensaries was 870,335 (767,710). Government is pleased to note the growing appreciation by the people of the value of preventive inoculations and the other beneficent activities of the Department. Advantage was also taken of the larger cattle fairs and other means of propaganda for giving increased publicity to these activities.

"Government shares the Director's disappointment at the apathy of many local bodies towards the provision and repair of dispensary buildings. Expenditure for ensuring the efficiency and expansion of a department, which does so much to conserve the cattle-wealth of the agriculturists, is certainly an important charge on local funds even in the present financial stringency; and Government hopes that there will be a better response in future to its appeal regarding this matter.

"Government has noted with interest that the year marked a further advance in the researches in connection with the goat-virus inoculation against rinderpest. The cost of inoculation can now be reduced from three annas per head to one anna per six to ten animals, while the district reports indicate that the period of immunity derived from this method of inoculation promises to be longer. These results encourage the hope that the ideal of the eventual eradication of rinderpest envisaged by the Director is not perhaps Utopian; and Government trusts that they will facilitate the working of the Cattle Diseases Act which was passed into law after the close of the year. Power has been taken by this measure to prohibit the import into the province of unimmunised and peripatetic herds of cattle which are responsible for the dissemination of infection, particularly that of rinderpest. The Veterinary Investigation Officer, appointed by the Imperial Council of Agricultural Research, continued his local enquiries regarding certain cattle diseases and internal parasites. Government's thanks are due to the Council for its financial assistance, which has made this intensive study of the ætiology of the cattle diseases of the province possible.

"Much credit is due to the officers of the Department for the year's record of preventive, curative and research work and Government has read with pleasure the Director's commendation of it. It also records its appreciation of the efficient administration of the Department by the Director, Major R. F. Stirling, and the Deputy Director, Rao Bahadur R. V. Pillai, who officiated as Director for part of the year."

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HISTORY OF VETERINARY MEDICINE IN THE UNITED STATES

In a paper presented to the 1933 meeting of the American Veterinary Medical Association, Joseph M. Arburua observes that it is safe to say that American Veterinary literature did not exist prior to the nineteenth century, the "form of veterinary art" that existed in the eighteenth being in the hands of the farrier and the cowleech, who were "of the lowest social standing and whose ignorance was appalling." The settlements were sparse and animals were scarce, consequently there were no epizoötics of any magnitude and problems of animal pathology did not receive the study accorded them in other and more congested countries. When outbreaks did take place—as of rabies in Boston in 1785 and again in 1789—it did not occur to anyone that their control was in any way related to the veterinary profession. Animal disease control was viewed as a medical problem, to be handled purely from a human standpoint. Texas fever, however, had for long been a problem in the South, and in 1795 a law controlling the movement of cattle in connection with this disease was passed by the North Carolina State legislature and

would appear to be the first legislative enactment made in the U.S.A. in connection with animal diseases.

Mounted troops were not authorised in the military service until 1792, in which year an Act of Congress was passed providing for a squadron of light dragoons composed of four troops, with one farrier (entrusted with the treatment of the horses) to each troop.

In the 25 years preceding 1850 a definite tendency toward the organisation of veterinary medicine could be seen. During that period hog cholera and contagious pleuro-pneumonia of cattle made their appearance and it was in 1837 that Dr. Henry Elsworth, then Commissioner of Patents, perturbed by these losses amongst agriculturists, by suggesting the extension of aid to farmers through the giving of advice on agricultural matters (including animal husbandry) took the first of the series of remarkable steps that made the Patent Office responsible for the establishment of the United States Department of Agriculture which, in its turn, developed into the Bureau of Animal Industry.

It was during this period, too, that there was included in the Act of Congress providing appropriations for the support of the army, authorisation for the "hire of veterinary surgeons" and "medicines for horses and mules"—the seed from which was eventually to grow "our present small, but efficient, Army Veterinary Corps."

Beyond a doubt the best veterinary literary productions of this time were the several American editions of Youatt's works by various individuals; they were a blessing to the American public and served to dispel many of the barbarous practices then in vogue and to discredit the "disreputable horse traders, anvil artists and livery stable parasites calling themselves farriers and veterinary surgeons—often assuming that title overnight." Some of the more intelligent stock-owners were very dissatisfied with those frauds and began to refer to the more popular veterinary books of the time—those of Taplin, Clater, Youatt and others.

The article concludes with references to the earliest graduates in America, stating that, from the fact that so well-known a practitioner in England as Bracy Clark took his nephew Charles from America into partnership in 1817, it must be assumed that prior to that year there must have existed at least one qualified veterinarian in the U.S.A.

The first European graduate, apart from Clark, to settle upon American shores was John Rose—a Prussian graduate who settled in New York in the year 1827, he being followed closely by Saunders, from England. Three years later Dr. Isaiah Michener, who contributed to the first veterinary periodical of America (*American Veterinary Journal*) began practice in Pennsylvania. He was the father of C. B. Michener, one of the first American graduates, and who later became secretary and president of the United States (now the American) Veterinary Medical Association.

This paper, which appears in the *Journal of the American Veterinary Association* for July, 1934, is to be continued.

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FIFTY-FIVE-YEAR-OLD HORSE

The Bulawayo Correspondent of the Central News Agency reports that a horse which belonged to Mr. Alexander Lawrie, a Bulawayo farrier and coach builder, has died aged 55. It was named Rocketter and was won as a pony in a raffle.

From *The Veterinarian*

DECEMBER, 1834

On November 14th, the new theatre of the Edinburgh School was crowded with pupils. The appearance then exhibited must have been gratifying to the talented, and industrious, and highly deserving Professor of that institution. "A casual attendant" expressed much surprise that, in a history of the progress of the veterinary art, and an enumeration of the veterinary schools, given in a late introductory lecture in another place, no mention was made of that institution which, at the solicitation and under the patronage of the Highland Society of Scotland, was founded by Mr. Dick.

We would fain attribute this to inadvertence, or to the nervousness which every lecturer experiences when he appears before his class at the commencement of a new session—to any thing rather than design. Mr. Sewell knew full well that the Clyde Street school did exist, and was progressing; and that it was—what every veterinary school ought to be—not merely devoted to the cavalry service and the pleasures and sports of the higher classes of society, and, to a certain extent, the facility and advancement of commerce, yet, in a very insufficient degree, connected with the wants and welfare of the farmer; but that it was identified with the agricultural interests of the country, and had become a part and portion of them. Mr. Dick is veterinary surgeon to the Grand Agricultural (the Highland) Society of Scotland; he attends, *ex officio*, their principal meetings; his counsel is sought and has its weight in many of their proceedings. In the lesser agricultural societies of Scotland his pupils occupy a similar situation; and there is scarcely a farmer's club that has not its efficient veterinary surgeon. Shall we reverse the picture? There is no agricultural society in England that has a veterinary surgeon professionally attached to it; no one that courts the aid of such an officer, or would listen with common patience to him, or be swayed by his opinion on a purely agricultural subject. We are not drawing invidious *general* comparisons; but here is *one good point*, and whatever inferiority in other respects may attend the Edinburgh school, it was entitled to some brief and passing mention in a professed list of veterinary institutions.

We can even less easily account for the omission of the Abou-Zabel school; for, although this gentleman *says* that "he never reads *The Veterinarian*," yet one would have thought that in his general reading (we must not say his general mingling with veterinary society, for that he does not do) he must have heard of the noble devotedness of Hamont, and how, at the very hazard of life, he founded the first school in Africa; a school in which the honour, the grade in life, the dearest interests of the veterinary surgeon, were sedulously secured. When he predicted the speedy establishment of a school in America, and expressed an interest in its success, it is singular that he could bring himself to pass over the Egyptian college in utter silence.